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A Retrospect of Geography

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SIGNS OF PROGRESS

In looking back over the period of forty years that has elapsed since the Sub-Committee of Ten on Geology and Geography met in Chicago under the chairmanship of the late Professor T. C. Chamberlin in 1893, two encouraging indications of advance in the standing of Geography in our educational system are to be seen. One is the organization of the Association of American Geographers; the other is the greatly increased attention given to Geography in our colleges. These two advances have very naturally gone hand in hand; they have reacted on each other to mutual profit, and the two result in a third advance: a great increase in the number of college students who are attracted to Geography as a subject worthy of their attention.

Mention should perhaps be made also of what may be called an advantageous event; the Transcontinental Excursion of 1912, by which the American Geographical Society, which has since then developed its excellent Geographical Review, celebrated its sixtieth birthday; for I am sure that the good number of American Geographers who took part in it were much encouraged, by the acquaintance they made with a strong representation of European geographers, to strive on in their studies and to increase their proficiency. It is worth recording that four of those American geographers were members of the Peace Conference in Paris following the World War; that they were given instant welcome on their arrival in Paris by the French geographers whom they had met on the Excursion; and that one of them, who was sent to four enemy capitals in search of geological information needed at the Conference, was heartily and helpfully received in

each capital by a local geographer whose acquaintance the Excursion had given him an opportunity of making.

THE VAST CONTENT OF GEOGRAPHY

But with the above noted indications of gratifying progress there has come, to my own mind at least, an increasing recognition of the inherent complexity of Geography as a subject of school and college study, and of the difficulties that must be met and overcome in selecting from its content those parts which are most worthy of attention in secondary and collegiate education.

The total content of Geography is, like that of various other worthy subjects, so vast as to be almost overwhelming; but a better agreement appears to have been reached in a good number of other subjects than in Geography as to which of their parts should be selected for study in successive educational years. We have as yet no approach to the establishment of any such well defined units of quantity as are marked off by the books of Caesar, or the lines of Virgil which the Latinists adopt; or by so many theorems of Plane Geometry followed by so many of Solid Geometry which the mathematicians accept; but perhaps it is, after all, just as well that Geography is not, or at least not yet, so cut and dried as those long-established subjects are. It is, however, rather regrettable that we have not made as much progress as we might have wished to witness toward a closer agreement as to the classification of the content of Geography, and as to the systematization of the best methods of presenting it in order to get discipline as well as information out of it. It seems almost as if every one of us were independently working his own way toward his own goal. If this is disappointing in one way, let us get what satisfaction we can out of the fact that our independence is suggestive of individuality and of freedom from authoritative supervision and restriction. Long may that freedom continue!

Geography is Composite, like most other Subjects.—We have had, to be sure, some excellent and admonitory advice in the annual addresses of the presidents of our Association. Fenneman has shown us that Geography is a composite rather than a single and independent subject; indeed, as he presented that matter, Geography would seem to be made up not so much of material of its own as of selections from many other subjects, each of which preserved an individuality in its own field, as if it were more unified than Geography is: but I have serious doubts on that point. History

is surely as composite a subject as many another, and the flavor of Geography that enters into its composition must be as strong as the flavor of History that should enter into the composition of Geography. True, some historians may be said to treat their subject "in the air"; for I recall seeing a history of Switzerland in which the Alps were not mentioned; and I have met a historian who pictured the landscape of Rome as "seven hills on a plain"; but there are fortunately other historians, and able ones, too, who base their subject on solid geographical ground. Indeed, one admired and respected member of that group who is lately lost to us by death had so lively an interest in the geographical aspects of History that he took membership in our Association. The composite nature of History is made manifest when we recall how largely problems of metallurgical and mechanical Engineering, as well as problems of Government and Economics, enter into it; for what historian can overlook the share that the Bessemer method of making steel and the replacement of sailing vessels by steamships has had in modifying the civilization of the last century!

Philology is also manifestly composite, not simply as to the many languages that it studies but also as to the aid it receives from other subjects. This is particularly true when its evolutionary aspect is considered, for in that advanced phase of its investigations it must call History and Geography to its aid, and Biology and Psychology also. What but geographical isolation has permitted the evolution of dialects and tongues? What but our inheritance of five terminal sub-divisions in each of our four limbs from a long line of anthropoid ancestors has led to the selection of 20 instead of 19 or 21 as a "score"? What but geographical out-wandering has determined at once the diversity as well as the relationships of the Romance languages? Many of our words are only "fossil metaphors," and some of the metaphors are of a more or less geographical nature; for example: rival, down, amount, upright, downright, haughtiness and a host of others. A monograph on the influence of Geography on Language would be instructive.

Let no geographer therefore feel himself peculiarly conditioned because his subject is composite. For various other subjects are also composite. Few indeed are not. Subjects which, like History, Geology and Geography, deal with things or events of many kinds in definite relations to time or place, cannot have the singleness of content which subjects like Mathe-

matics and Physics and Chemistry possess, in view of their dealing with the relations or properties of things apart from their situation in time and space. This is well shown in the science of Astronomy: for it is essentially the Mathematics and Physics and Chemistry of the Universe. If organic beings were found on Mars or elsewhere, selections from Biology would become another component of Astronomy. Surely, an astronomer is still an astronomer when he is calculating the orbit of a comet by mathematical methods, or determining the composition of a star by spectral analysis. Of course one may, if he wishes, logically enough argue that anyone who employs mathematical methods is thereby converted into a mathematician; but one may also logically enough assert that the employment of mathematical methods for astronomical purposes transmutes them into Astronomy. Thus one might fairly say that History is not a composite subject, made up of selections from Geography, Economics, Agriculture and so on, but that those selections are transmuted into what we know as History when they are used there. Similarly, Geography is not a composite of Geology, Biology, History and so on, but extracts from those subjects are transmuted into Geography when they are used for geographical ends. Indeed, all this matter of the classification of the sciences takes on a very subjective aspect if it is far pursued, because it then varies with the preference of the pursuer. Objectively viewed, all knowledge is one vast, intertangled web of acquisition. We may, for purposes of educational administration, of book publication, of professional success or of philosophical edification, subdivide the total acquisition into groups, and show that the central part of each group is characterized by some common quality or relation or object; but it is a highly artificial procedure to cut the groups apart or to set up fixed boundaries between them. Indeed, the intimate marginal interconnections that unite different groups are often as profitable a subject of study as their most independent centers.

No geographer, therefore, need feel himself unfortunate because of the great diversity of the facts that his composite subject requires him to study; for in the progress of his work he may discover relations and principles which bind his facts together in a thoroughly reasonable manner, and he may then concern himself, especially in his teaching, largely with those relations and principles, and introduce items of fact chiefly to illustrate the principles. Unhappily, geographers are often so impressed with

the innumerable facts of their subject that much of their attention is given to individual occurrences in specified localities rather than to the principles which the occurrences exemplify; and this is regrettable. Yet practically the same comment may be made on History, in which the mere sequence of events or, still worse, the mere occurrence of events is often given a much greater emphasis than their inherent importance warrants; and too little time is then devoted to the search for the meaning of the events and for the underlying causes of their occurrence and sequence.

A good deal might be said, I believe, in favor of teaching selected examples of many kinds of historical or geographical facts in their causal or systematic relations, instead of teaching them primarily as disconnected items, isolated in time or in place; and I wish great success to those teachers who are now trying to test the relative value of these two methods of teaching by experiment. One kind of teaching would cultivate intelligence more than memory; the other would cultivate memory more than intelligence; and of those two mental faculties, intelligence is surely the more valuable.

Geography is less composite than Geology.—Very much as Fenneman has emphasized the composite nature of Geography, almost to the point of treating it as a regrettable characteristic of our subject, so Johnson has shown the difficulty of mastering its enormous and composite content, and has shown also that, in view of the many diverse opinions as to what its content really is, in view of the small number of competently trained geographers, and in view of the usually indiscriminate membership of various national geographical societies, our subject has not yet gained the standing which he thinks it deserves in the learned world. He not only recognizes its dual nature, that is, its inorganic and organic parts; he also emphasizes "the great but necessary sacrifices required by the double preparation essential for effective geographic research." His address is truly illuminating in all these respects; but it does not seem to me that Geography stands so much alone as he implies, either in being of dual nature or in requiring any unusual "sacrifice" for its mastery.

Geology is as dual, or one may well say as multiple as Geography. Its content is more enormous, and its mastery is much more difficult than that of Geography. It demands a systematic understanding of mineralogy, petrography, tectonics and paleontology; and each of these subjects must be based on a preparatory study

of other subjects. If Geography borrows much material from the more profound science of Geology, Geology ought to be a willing lender, for it employed the borrowing device long ago by taking over a large amount of material from Geography; indeed, without that initially borrowed capital it could never have been set up in the big business that it is now so successfully conducting. Furthermore, Geology calls for a knowledge of the distribution of its composite content over the world's outer crust in place and through the world's long history in time. Such a dual distribution is ever so much more difficult to discover and to learn than the distribution of the composite content of Geography; for much of the content of Geography is visible, so that it may be learned by the relatively simple faculty of observation; and it is, moreover, only one layer deep; but a large part of the content of Geology is invisible, so that it must be learned by the complicated faculty of inference; and besides that, it is many layers deep and each layer or group of layers must be studied out separately.

Yet formidable a subject as Geology is thus seen to be, it is generally regarded, not as a severe and repellant, but rather as an entertaining and attractive collegiate study; and I have never heard the labors that are given to learning its many different parts spoken of as "necessary sacrifices." Bright-minded students regard their work as an enjoyable opportunity! This is in good part because, fortunately for the young geologist, he is as a rule expected to become well grounded in the systematic principles of the various components of his science before he is called on to go far in the very difficult task of combining the components either in their geographical distribution or in their historical sequence. If anyone wishes to know how profundly difficult the complete accomplishment of that task would be—the task of combining all the various components of Geology in those two aspects—let him take Suess' several-volumed "Antlitz der Erde" as an introductory text, and then try to conceive what he would have to do if he set about learning all the pages of a many-volumed geological encyclopedia, which told all about all the formations in all the localities of all the world! No geologist attempts so impossible a task. He makes Geology a practicable science by not trying to learn all of it; and judging by the recent and very surprising expression of opinion of an experienced geological committee, a geologist may reach a good rank in his science with hardly more than a nominal knowledge of mineralogy, petrography, tectonics

and paleontology, and with practically no knowledge at all of the historical evolution of most of the continents, provided he has done good work in the limited part of his science that he cultivates!

Let no young geographer, therefore, be disheartened when he discovers the multiple nature of his subject or the impossibility of mastering all its content. Let him first secure a good understanding of the fundamental components of Geography, and then select some special component to study systematically in its occurrence all over the world, and some special area of the world in which to study all the components in their regional associations. He will thus, on reaching middle age, have gained expert acquaintance with his selected component everywhere, and with all the components in his selected area; and that will suffice to make him through his later years a real geographer.

THE RELATION OF PHYSIOGRAPHY TO GEOGRAPHY AND GEOLOGY

Perhaps as a means of lightening the geographical load, Johnson places the study of Land-forms or Geomorphology with Geology; but this seems to me as geographically regrettable as it would be geologically regrettable to place Mineralogy with Chemistry, with Optics or with Geometry. Landforms may, to be sure, be studied from a geological point of view if one desires to trace their historical development; but they may also be studied from a geographical point of view if one wishes to describe their present appearance. It is, therefore, in my opinion, a geographical misfortune to have Landforms taught only under Geology, because when so taught they will not be presented in the manner best suited for their geographical use. Surely Crystallography should not be taught under Geometry, but under Mineralogy where it is used. Or to illustrate this principle by a *reductio ad absurdum*, the art of verbally describing the content of any subject should not be taught under Philology or Rhetoric, but under the subject itself.

It is perfectly true that the rational or genetic study of Landforms was introduced into modern Geography from Geology, very much as the spectroscopic study of stars was introduced into modern Astronomy from Physics; but that was only a very fair return for the abundant geographical facts which Geology had borrowed for its own advantage. Similarly, the rational understanding of those long-recognized geographical factors, Weather and Climate, has come from Astronomy and Physics; but it would be geograph-

ically disastrous to have them taught only under those sciences, instead of in close association with other geographical factors.

It may, of course, be objected that the mental discipline required in the explanatory study of Landforms or of Climate is unlike that required in the study of other geographical topics, like cities and deserts; but unity of mental discipline is rarely if ever realized in any subject. Certainly not in History, into which a knowledge of Language and of Economics enters about as intimately as a knowledge of Mathematics and Physics enters into Astronomy, or as a knowledge of Chemistry, Optics and Geometry enters into Mineralogy. Land-forms are indeed, so essentially, so fundamentally geographical in their nature that, whatever discipline is involved in gaining an understanding of them, their study should, in so far as it concerns an appreciation of their visible features, be closely associated with the other subdivisions of Geography. It is only when the history of Landforms is sought for that they should be studied under Geology. The great improvement that has come over the study of hills and valleys, lakes and islands by treating them genetically is by no means a sufficient reason for separating them from the family in which they were born and placing them permanently with the foster-father who did so much in bringing them up.

Contrasts of Geological and Geographical Physiography.—Profit may be found by preparing two accounts of a single region, one in geological, the other in geographical form. The differences as well as the resemblances of the two styles of treatment are thereby clearly brought out. The first will be chiefly concerned with a succession of past events and will therefore use past-tense verbs, like *was* and *has been;* the second will be chiefly concerned with present-day description, and will therefore use present-tense verbs, like *is*. Thus, the uplands of the middle Rhine may be described geologically as having been in Paleozoic time the seat of deposition of stratified rocks, in which argillites predominated, but which included also some resistant igneous intrusions. The region was greatly compressed at the time of the post-Paleozoic or Hercynian revolution, whereby it was raised in disorder and carved into mountainous forms. But in later time the mountains were worn down to a lowland of moderate relief, above which the resistant igneous rocks survived in linear ridges, until a broad movement of upheaval took place—or, as Philipsson has suggested, a broad movement of depression lowered the

land between this interior region and the sea coast—whereupon the chief rivers, Rhine, Mosel and Lahn, incised their courses in deeper valleys than before. As the upheaval was in two movements, with a longer pause after the first than after the second, the incisions were given a composite form; mature valleys of moderate depth were first eroded, and in their broad floors narrow gorges have been excavated. At the same time many branch streams eroded many lateral ravines which gradually die out in the swales of the upheaved lowland. Sixteen past-tense verbs are here employed.

A shorter geographical presentation might be as follows: The uplands of the middle Rhine are an upheaved peneplain, developed on a body of greatly deformed stratified rocks, chiefly slates, but including several belts of resistant igneous rocks which survive as linear monadnocks. The chief rivers, Rhine, Mosel, and Lahn, flow in nearly graded, somewhat meandering courses with narrow flood-plain scrolls at the bottom of step-sided gorges which are intrenched in broadly opened valley floors at mid-height level, thus indicating that their excavation results from a double movement of upheaval with a longer pause between the two movements than since the second. The side streams, rising in the slightly deepened swales of the upheaved peneplain, follow narrow ravines of steep gradients to the rivers. Here are nine present-tense or present-participle verbs.

The difference between the two descriptions is not great; but the first very properly takes the reader far back in the remote geological past, while the second as properly holds him in the geographical present. The second method of presentation is not learned if Physiography is taught under Geology; and young geographers who have learned their Physiography under geological tutelage sometimes think it is too much concerned with the past to serve their present-day needs. It is geographers of that type who do not care to know, for example, that a certain highland is an uplifted and immaturely dissected peneplain, for to them that phrase only means past history; they fail to see its illumination of present facts.

THE TERMINOLOGY OF GEOGRAPHY

Another of our presidents, Campbell, has lectured us rather severely on our recklessness in the invention and our carelessness in the use of terms; but the sting of his reproofs is dulled when

we find that he has "no doubt that the terminology of other sciences is affected in a similar manner," that their terminology is as "disordered and chaotic" as ours, and that they are, like ourselves, "burdened with a mass of terminological rubbish." Curiously enough, he avows that, at the time of his address, he had only recently "awakened to the realization that the selection of an appropriate terminology is just as important as any other phase of scientific work." His censure of our bad behavior may therefore have been largely caused by his astonishment at the state of things he discovered when he was suddenly aroused from his preceding somnolence. But he gives us many striking examples of the ill-considered use of words, drawn from his great collection of 10,000 definitions of some 3000 terms; and then he goes so far as to say that we seem to "leave to the impulse of the moment the terminology to be employed in the presentation of our results to the study of other geographers and to the general public."

In some cases, however, he seems illogically over-severe, as in his charge that American geographers misuse the term, Physiography, because, in proposing to make it the equivalent of the earlier binomial term, Physical Geography,[1] they departed from instead of following Huxley's use of it as meaning "natural phenomena in general"; although Huxley had candidly stated that he used the word in a different sense from that which it had long possessed in Mineralogy. So if we deserved blame, why not blame Huxley also! As to Campbell's point that "Huxley's use of the term was strictly in accord with its literal meaning," not much value need be attached, for we find the same Greek root, meaning "nature," in such words as Physics, Physiology, and Physiognomy, which are as well established in our composite language as they are unlike in their several departures from the "literal meaning" of the root.

Indeed, Campbell himself proposed a most extraordinary departure from the ordinary usage—a much greater and a much more impracticable departure than ours was in departing from the meaning of Huxley's term—when he advised that the old subject, Geography, if "used in its best and broadest sense," should include the work of ethnologists, biologists, and economists, as

[1] My own vote in the Sub-committee of Ten was against the adoption of the compressed term; but as the majority of the members favored it I later followed their lead.

well as that of geomorphologists and ordinary geographers. Why not of historians and geodesists also? Unfortunately, Campbell's recommendations for our reform are not specific. It may be inferred, however, that he would advise geographers to educate themselves more carefully; and as we are probably all of one opinion on that axiomatic matter, I may now turn from the content of Geography, which has been my theme so far, and consider its educational standing.

GEOGRAPHY IN EDUCATION

My feeling on that important phase of our subject is as dual as its content. I rejoice at the many indications of our progress and I regret that the vast amount of poor teaching that is still perpetrated. It is to be hoped that better teaching will gradually work its way into the schools as the teachers, while studying in the colleges, are better prepared for their work; but the betterment must be slow, because good teaching of Geography is a very difficult art. Many teachers are, I believe, striving to teach their Geography lessons well; and the measure of success that they have reached in certain progressive schools is most gratifying. But the volume of poor teaching that is still going on is discouraging. I have had convincing evidence of that sad state of affairs in connection with summer courses, which are so largely attended by teachers, not only some 30 years ago at Harvard but also in the last five years in California. Perhaps, however, Geography is not much worse off than other school subjects, if one may judge by the complaints of certain pessimistic educators. But instead of pursuing these melancholy reflections further, let me indicate the directions in which I believe improvement is now in progress.

INDICATIONS OF BETTERMENT

Improvement is seen first, as already intimated, in the increased attention given to Geography in many of our colleges. The progress made in that respect during the past 50 years is astonishing! Next is the better work on Geography in normal schools, although I fear that they are not yet abreast of the colleges, because too many of them still over-emphasize method and give too little attention to subject matter. Third is an increasing turn from locality teaching to rational or causal teaching; that is, as I have suggested above, a diminution of the teaching of separate

items and an increase in the teaching of principles and relationships. We have, I hope, banished from our teaching mere lists of counties and capes, mere memorized location of cities, boundaries of states, branches of rivers, and tables of products; but we have not reached any general agreement as to what should take their place. And here it may be noted that it is primarily because we have not yet standardized the essential principles of our subject that examinations on school geography for admission to college are not regarded with great respect; not that well-taught high-school Geography could not be made disciplinary enough to serve admirably as a basis for college studies, but that it has not yet been possible to establish high-school courses in Geography as disciplinary as courses in Mathematics and Classics, so that serious, respect-worthy examinations can be set upon them.

STANDARDIZED PRINCIPLES

Here I wish to make a practical suggestion: Let our Association select some 40 or 50 geographical principles of world-wide application, which would be everywhere as true in Geography as the binomial theorem is in Algebra, and select also a few first-class illustrations for each principle. Let these standard principles and their illustrations be introduced in all new text-books and be everywhere taught in a standardized manner; but let the texts and the teachers be free to add any new principles and to exemplify all the principles with as many new facts as they like, taken from any region they choose. Then examination questions could be phrased so that the pupils would immediately recognize the principles or the standard illustrations involved, and they might illustrate the principles by their own selection of facts. I am persuaded that we might thus set forth a good number of principles in so interesting a manner that our pupils would like to remember them, that the facts could be so well barbed with meaning that they would catch and stay in the pupil's memory, and that we could furthermore supplement the principles with facts so diverse as to permit texts and teachers to preserve abundant individuality. Geography would then serve as a basis for strictly disciplinary examinations.

In doing this, we might incur the censure of those old-fashioned Gradgrinds who are so infatuated with lists of itemized facts that they regard no one as geographically educated who cannot name all the capitals of all the countries of the world, or locate all

the rivers and harbors and mountains and islands to be found on the maps of a school atlas. They unfortunately undervalue the rational knowledge of principles and causal relations which bind together a moderate number of carefully selected facts, as compared with the empirical knowledge of a far greater number of isolated facts, because they have no acquaintance whatever with geographical principles and relations. But even if we incur the censure of these precisionists, we shall deserve and receive the blessings of our students, who will rejoice in having gained ability to find new examples of causal relationships, new meanings in the old world as they live through their lives.

EXAMPLES OF STANDARDIZED PRINCIPLES

Let me give a few examples of the kind of general principles I have in mind. Villages and cities begin as comparatively small settlements in locations determined by their immediate or local surroundings. Some such settlements remain small or even disappear; others grow, some of them to great size, provided they have an advantageous relation to their larger or regional surroundings. Professor Raoul Blanchard of Grenoble and Harvard, is a leading expounder of this principle. New York, Chicago and San Francisco are notorious examples of cities that began in a small way, dependent on their local surroundings and have grown great because of advantageous regional surroundings. The older countries of the world have innumerable villages that are today not much larger than they were centuries ago. The village of Stonne in northeastern France lies where a rectilinear Roman road, that connected Rheims and Trèves, crossed a notch in a high cuesta; it presumably had the advantage of commanding the passage of that notch when it was established, but it had no more general advantage, so there it remains an isolated minim. In southeastern France, a good number of villages still survive on hilltops, where they were built some centuries ago in order to be less exposed of attacks from marauding pirates; there they still remain, requiring their people to make a laborious ascent after every day's labor on the near-by lowlands. Some villages or towns disappear when the local advantage that caused their beginning is withdrawn: such are seen in various stages of decay in abandoned mining and lumbering districts. Railroad construction-towns sometimes suffer the same fate: witness Sherman, built on the broad and flat divide of the Rocky Mountain highlands in Wyom-

ing during the construction of our first transcontinental railroad sixty years ago; now only a name, not a village. It would be a dull class that found no entertainment in studying cities in the light of the principles above indicated.

The distribution of plants and animals offers many examples of the principle that every species will spread as far as it can, and also that, if it thereby becomes isolated, new species will be evolved. The cassowaries of northern Australia and the adjacent islands provide a standard illustration. They are heavy and wingless; they cannot either fly or swim. They were all of one species before the islands were separated from the mainland by regional subsidence; now there are about as many species as there are islands. The condor, a bird of powerful flight, affords an illustration of another kind: its original home was on the cool pampas of Patagonia; but when the recent elevation of the Andean lowland to highland estate extended a Patagonian climate to and beyond the equator, the condor extended its range correspondingly. A simple but much less famous case is found in Clear Lake, which lies 100 miles north of the Golden Gate in the Coast Ranges of California: the waters of the lake have flooded a pre-existent intermont basin-plain, in consequence of a recent but prehistoric landslide in the mountain gorge by which the plain was formally drained. Gulls, pelicans, cormorants, cranes, bitterns and various wild ducks are found there now, but not on the neighboring basin plains. It is not to be expected that the distribution of all animals can be so easily explained as the above examples; but enough easily understood examples can be presented to give good ground for belief that the many other less apparent examples must have similar even if more complicated explanation.

Routes of travel and traffic seek low-grade paths, such as are commonly found along the floors of river valleys; but if a valley is so young that it has no open floor, as is the case with the Grand Canyon of the Colorado, it does not become a pathway. On the other hand, the gorge of the Rhine between Bingen and Bonn is open enough to have room for a roadway along all of one side and most of the other also, and for railroads along both sides, and the river is large enough and nearly enough at grade to be navigable; so it is throbbing with life, while the uplands above it remain in bucolic quietude. The Mohawk Valley in the state of New York is a good text for the story of transportation; and, in contrast with the profitable history of a great four-track railroad

that follows it from tidewater at Albany into the interior, is the disastrous history of another railroad that tried to make a short-cut from New York to Buffalo across the many hills and valleys of the northern part of the Appalachian Plateau. There is no end to this sort of geographical material; but I like to add that in every part of it the form of land plays so important a rôle that it must make a part of every story. Why, for example, does the open Mohawk Valley suddenly constrict itself above its mid-length into a narrow gorge of steep fall, enforcing curves and grades on the four-track railroad that runs close along its side, to say nothing of crowding together also a highway, a second railroad and a barge canal? The answer to that question leads to a fascinating story; but there is no space for it here.

It would be a great assistance in raising the status of Geography by teaching its most important principles and their illustrations, as suggested above, if we had a good supply of "Readers" prepared in such a way as constantly to bring forward and to enforce the causal relation between the earth and its inhabitants; also a supply of Regional Handbooks in which the same fundamental lesson might be enforced with respect to certain areas. There is no question that such books would be interesting enough to attract and hold the attention of students. When considering such aids we should not forget that Arnold Guyot did his best to introduce the causal notion among us 70 years ago,[2] but he could not go far because the Philosophy of Evolution and the Science of Physiography had not then been developed.

THE GEOGRAPHY OF CITIES

A precaution must be suggested in order that the study of cities, to which allusion was made in the third preceding paragraph, shall be given a truly geographical character, and thus avoid becoming too historical. Their historical study traces, apart from many governmental problems, the successive phases of their areal development through the years; their geographical study presents their areal development only in so far as its effects are visible in their present form. This may be illustrated by an example:—The important city of Köln was founded nearly 2000 years ago as a small Roman *Colonia*—whence its modern name—of squared streets enclosed by a rectangular wall. It was located where a primitive

[2] See my review of "The Progress of Geography in the United States," *Annals Assn. Amer. Geogrs.*, 14 (1924), 165-169.

route of travel and traffic came to a crossing of the Rhine, and was placed on the west bank of that river because the Romans had not conquered the wilderness of Germania to the east of the river. Years after their expulsion, a larger medieval city with narrow, tortuous streets, grew around three sides of the squared old town, and in the 12th century several suburbs were taken in, thus giving the whole, which was enclosed by a rampart with walls and gates, roughly the form of a semicircle. From 1794 to 1815 it was occupied by the French, and we therefore generally know it by their name, Cologne. The ramparts were so far outgrown in later years that they were demolished 50 years ago and replaced by a fine boulevard; and the north, west and south gates of the ramparts were converted into museums. A new line of fortifications was then constructed, again of roughly semicircular pattern, about half a mile farther out from the old Roman center.

A geographical description might be as follows: The large city of western Germany which we know as Cologne, because of its occupation by the French from 1794 to 1815, but which the Germans call Köln, a modification of the original Latin name, Colonia, is located at an ancient crossing of the Rhine, and lies on the west bank because its founders, the Romans, did not conquer the country to the east of the river. In its center one may still see the squared streets of the original town, the border of which follows the course of the rectangular wall by which it was enclosed. Outside of it on the north, west and south are the narrow and tortuous streets of a medieval city, the rampart enclosing which, demolished half a century ago, is now followed by a fine boulevard of roughly semicircular course. Three gates of the ramparts are reconstructed as museums, while new fortifications, again of roughly semicircular pattern, now stand half a mile farther out from the old center.

The unlikeness of the two forms does not lie so much in their content as in their points of view, which differ in very much the same as the geological and the geographical presentations of a physiographic problem differed, as given above. There is, of course, abundant and interesting historical material that might be added to the above brief geographical story about Cologne, just as there is abundant geological material that might be added to the short geographical story of the middle Rhine; but a strong geographical discipline will never be developed by such additions, just as a strong mathematical discipline cannot be developed by

diluting Geometry or Algebra with entertaining items of a historical or physical nature. If space is available for a longer geographical story about Cologne or the middle Rhine, it should be filled with additional geographical material, for there is plenty of that also: but we must now return to our previous theme.

Practical Exercises.—A fourth direction of improvement in the modern teaching of Geography is found in the increase of practical exercises or laboratory work, and of field work also; but much progress is yet to be made in this direction. One subject that is capable of highly educative and disciplinary development through practical exercises is what used to be called Mathematical Geography, or what may be more simply called the Earth as a Globe. It is ordinarily introduced in early years and taught indoors in such a way that young pupils have no real sense of what it is all about. Moreover, it is taught so rapidly that the pupils have no opportunity of making their own discoveries of certain of its elements, as they might if it were taught slowly and by outdoor observation. The pupils might thus be led to determine for themselves the length of a day and a year; and when so led the things they would learn would become vivid realities.[3] The difficulty in such teaching is not that it takes too much time or that it strains the intelligence of young scholars, but that it cannot be done in the course of ordinary class work; and also that its methods are, more's the pity, altogether unfamiliar to most school teachers.

Indoor laboratory exercises should, in order to be effective, be reduced to their most concise and most economical form, so that they can be easily and promptly and effectively handled. Apparatus and models are costly. The "wet laboratory" of the late Professor R. S. Tarr worked admirably, as far as it went, in his ingenious hands, but it involved so much preparatory work and its scope was so limited that its general use in schools proved impossible; even in colleges it has found no general adoption. Governmental maps afford many examples of geographical facts which may be profitably studied; but the labor and expense involved in making a good collection of such sources are so great as to prohibit their extended use.

Laboratory work on land-forms, for example, should involve a simple procedure on the part of both teacher and pupils, such as opening a manual at a designated page where a certain selec-

[3] See my article, "The Earth as a Globe," *Jour. of Geog.* 29 (1930), 330-344.

tion of ideal types is illustrated, adding to the diagrams or maps there found a few significant lines, the correctness of which is easily estimated by the teacher, or writing down definite answers to pertinent questions provided in an accompanying text, answers that can be learned only by an intelligent study of the opened manual.[4] In case it is desired to begin with the human instead of with the physiographic side of Geography, exercises on village or city plans, on road routes, or on property divisions may be first introduced; and there again a laboratory manual, in which many examples are concisely brought together in convenient form for desk use, would be a great time- and money-saver over collections of official maps on large sheets. There is no question that much intelligent interest may be aroused by comparing the rectangular pattern of an old Roman town with the disorderly grouping of buildings in a Celtic village; or by comparing the crazy-quilt patchwork of century old, hedge-bounded fields in Devonshire or Wales with the rectangular property lines of our national land survey on the prairies; or the zigzag indirection of north-south and east-west roads that one must follow on those new prairies when one wishes to go northeast or northwest, as compared with the radiating straight-line trails by which every village in certain parts of old Spain is independently connected with every other, for leagues around.

But I cannot resist the feeling that the forms of the land on which all these human elements are superposed ought to be fairly well understood before the superposed human elements are taken up. It certainly adds to the appreciative enjoyment of the subdivisions of Rome to know that the several hills of the Eternal City are only a contiguous seven of some seventy or more that border the flood plain of the Tiber where it has cut a consequent valley across the saddle between the long slopes of two adjoining volcanic cones; or to perceive that the T-like pattern of the villages in the gorge of the Rhine is enforced upon them when, after the cross-piece of the T grows along the narrow bank of the river near the mouth of a side ravine, the stem of the T grows up the ravine; or to understand not only that the irregular winding of certain old-time, one-street villages on Cape Cod, such as Brewster and Yarmouth, is a consequence of the irregular rolling of

[4] Allow me to note that my text and atlas of "Practical Exercises," prepared nearly 30 years ago on the above plan, still finds some use, and that it has been translated into German and Japanese.

the hilly land surface, the "backbone" of the Cape, but to know also that the backbone owes its irregularity to its being a segment of a little modified terminal moraine of the great continental ice sheet of late geological time.

Various exercises on Climatology may well be associated with some of those above suggested; but in view of the large texture of climatic units as compared with those of land forms and of such human elements as cities and roads and property lines, they are probably better combined with regional geography. In any case they cannot be further considered here.

The Swing from Physiographic to Commercial Geography.— In connection with my preference, above expressed, for beginning a serious course on Geography with land forms comes the memory of the swing of teaching in that direction 30 years or more ago, apparently in consequence of the report of the Sub-Committee of Ten, in which it was recommended that these fundamental elements should be rationally treated in terms of their origin. That memory is followed by a second, which records the swing of teaching away from Physiography towards Commercial Geography a decade or so later. I believe the second swing away from the first had three chief causes. One was that the school teachers of that time were not well enough trained in Physiography to teach it comfortably and effectively, even from text books. Another was that they linked it up so little with its human consequences that their pupils did not think it had any. The third was that the forms of the land vary so much from place to place that no general text can serve as a sufficient guide to their local explanation. It was, therefore, too much to expect that school teachers should teach Physiography from the land forms about them. College teachers should, of course, be able to do so, even if it is difficult to teach Physiography systematically from the land forms of our glaciated northern states.

But very much as the first swing gave too little attention to the human or ontographic element, the second swing gave too little attention to the physiographic element. It almost up-rooted the Ge- from Geography. Nevertheless, because Commercial Geography could be better presented in a text book and because it made strong appeal to the practical sense of the public, it has gained a strong hold: but some examples that I have seen of it seem to be so much like Regional Economics that they hardly deserve classification under Geography!

THE DRAMA OF THE WORLD STAGE

"All the world's a stage" in a very large and true sense. Landscapes and seascapes, modified by climate, provide the scenery, slowly changing as the earth's crust is deformed and eroded or aggraded. There are no falls of the curtain; the play is a continuous, never-ending performance. There is no pretense of the passage of days or months or years between the acts; they are all lived through in full. No distinction exists between performers and spectators; we are all of us both. The whole force of the company is on the stage all the time: no one remains behind the scenes. The only entrances and exits are births and deaths. To-day's part of the play is Geography; the integration of all its days forever is Geology.

If our school pupils and our college students could gradually acquire a realizing sense of this great, age-long play and of its intensely dramatic quality, together with an appreciation of the manner in which its action moves forward, and also a fair knowledge of some of its most striking situations, they would be well on the way toward understanding what Geography really is, even if they could not answer all the questions of certain examination papers.

Geography at the 1932 Annual Meeting of the Division of Geology and Geography of the National Research Council[1]

In the national organization devoted to the promotion and coördination of research in the natural sciences in the United States, the National Research Council in Washington, D. C., geography has been represented, in the Division of Geology and Geography, since the establishment of the Council in its present form in 1919. The membership of the Division consists of representatives of the scientific societies and government bureaus dealing with the two subjects concerned. From the beginning the Association of American Geographers has had representation in the Division. No account of the geographical activities of the Division has, however, so far appeared in the *Annals,* and it is the purpose of this brief note to report on those activities at the last Annual Meeting of the Division, on April 23, 1932.

The work of the Division is carried on mainly through committees. The Annual Meeting, which takes place in Washington on the Saturday preceding or following the Annual Meeting of the National Academy of Sciences, usually late in April, is attended by the members of the Division and the committee chairmen. (For the year ended June 30, 1932, these two groups together totaled about forty, of whom about ten were geographers.) The geologists and geographers meet together for the discussion of matters of common interest and hold separate sessions for the consideration of the work of their special committees. In the past few years it has been customary for the geographers also to meet informally the evening before the Annual Meeting to lay down the lines of the next day's deliberations. This year, through the courtesy of C. F. Marbut, the evening meeting was held in one of the rooms of the Department of Agriculture Building. The meeting of the Division as a whole was, as usual, held in the building of the National Academy of Sciences and the National Research Council. The present chairman of the Division is W.

[1]Contributed at the request of the Council of the Association of American Geographers.—W. L. G. Joerg.

H. Twenhofel. The following members and chairmen of committees constituted the geographical contingent of the Division during 1931-1932: Isaiah Bowman, M. R. Campbell, D. H. Davis, V. C. Finch, W. L. G. Joerg, Douglas Johnson, Wellington D. Jones, K. C. McMurry, C. F. Marbut, Raye R. Platt. The following attended the April 23, 1932, meeting by invitation: O. E. Baker (later elected vice chairman of the Division for 1932-1933), C. E. Birdseye, S. W. Boggs, N. M. Fenneman (later elected representative of the Association of American Geographers for 1932-1933), Lawrence Martin, Helen M. Strong. Mark Jefferson was elected a member at large beginning July 1, 1932.

At present the committees dealing with geographical projects other than those bearing primarily on physical geography are: Committee on Statistics of Agricultural Land Utilization (Wellington D. Jones, chairman); Committee on Coöperation with the Bureau of the Census (D. H. Davis, chairman); and Committee on Aërial Photographs (V. C. Finch, chairman). In addition there is the American National Committee of the International Geographical Union (Isaiah Bowman, chairman).

The Committee on Statistics of Agricultural Land Utilization was appointed to consider ways and means of having published, say every five years, a volume or volumes containing, for all countries in which such data are collected and published and by small political divisions, detailed statistics of agricultural land occupance and utilization. As a preliminary step the committee contemplated the preparation of a list of the volumes of agricultural statistics issued by various governments, with a view to publishing an annotated bibliography accompanied by a manual as a guide to the critical use of these statistics. In this task the work of the committee has been much facilitated by the publication by the H. W. Wilson Co. of New York of "Lists of the Serial Publications of Foreign Governments, 1815-1931," of which the eight issues already published comprise the majority of the countries of the world, and of a bibliography of official publications containing agricultural statistics which is being compiled by the Bureau of International Research at Harvard University and of which the lists for Denmark, Italy, France, Great Britain, Greece, Rumania, and Turkey have been completed. During the past year the committee has formulated the points which should be covered in the proposed annotated bibliography and manual and has been in correspondence with the Bureau of Agricultural Economics of the

U. S. Department of Agriculture with a view to the possible carrying out of this undertaking by the library staff of that bureau. The committee's suggestion has received a sympathetic hearing, but any such coöperation would have to be dependent on the provision of special funds. As yet no such funds have become available.

In its earlier stages, under the chairmanship of Professor N. M. Fenneman and with the coöperation of Professor A. K. Lobeck, the activities of the Committee on Coöperation with the Bureau of the Census were directed towards the preparation of a series of maps of the individual states of the United States on which the physiographic boundaries were plotted in such a manner as to conform to the nearest township boundaries. This work was undertaken with a view to providing the basis for grouping population, agriculture, and other census statistics according to physiographic provinces. Examples of the application of the method may be seen in the articles by A. K. Lobeck (The Physiographic Influence upon the Distribution of Population in Maryland and Pennsylvania, *Annals Assoc. Amer. Geogrs.*, Vol. 16, 1926, pp. 94-101) and C. E. Batschelet (A Picture of the Distribution of Population in Pennsylvania, *Geogr. Rev.*, Vol. 17, 1927, pp. 429-433). Subsequently the committee turned to other tasks, primarily the discussion with the Bureau of the Census of the desirability of tabulating by townships or minor civil divisions of equal rank a number of agricultural statistics now tabulated only by counties. In part as a result of the activities of the committee, tabulation of the data relating to utilization and value of land by townships has been secured in the 1930 census, but the Bureau of the Census has not seen its way now to tabulate in a similar manner, as requested, the data relating to crops and livestock. The work involved may be judged from the fact that tabulation by townships calls for handling approximately 150,000,000 punched cards and dealing with the statistics of 8500 units as compared with 3100 units if the county is used as the basis of tabulation. However, some assurance has been received by the committee that additional township tabulations will be made after the completion of the reports of the present 1930 census. The committee, in coöperation with similar committees of the Social Science Research Council and the Association of American Geographers, is also preparing recommendations concerning desirable types of data and modes of treatment

for the 1940 census. Among the recommendations which the Bureau of the Census has during the past year agreed to carry out is the preparation of state maps showing the smaller districts for which the census data are published. Heretofore no such maps have been available and hence the plotting of census statistics has been difficult, in some cases even uncertain where boundaries of enumerated districts run athwart of those of the existing administrative units.

The newly formed Committee on Aërial Photographs discussed the feasibility of establishing and maintaining a collection of air photographs, both obliques and verticals, for geographic purposes, and, if feasible, the ways and means of assembling and utilizing such a collection. In this connection it was learned that the Committee on Photographic Surveying of the Board of Surveys and Maps of the Federal Government has been studying the subject of indexing aërial photographic data (see *The Military Engineer,* Vol. 23, 1932, pp. 90 and 425) and that the question of a central depository for air photographs taken by government agencies had also been gone into. It was decided that the committee should acquaint itself fully with this work of the board before proceeding further.

The adherence of the United States to the International Geographical Union took place early in 1928 through the formation by the National Research Council of an American National Committee. The committee coöperates with the executive committee of the Union in carrying out the work of the latter: promoting exchanges of opinion, assisting in the work of the various commissions of the Union engaged in the study of specific geographical problems, and helping in the organization of the International Geographical Congresses that are now held under the auspices of the Union every three years. The American National Committee would be the body charged with the work of organization in the event that the United States is chosen as the seat of a forthcoming congress. Since the adherence of the United States there have been two International Geographical Congresses, one at Cambridge, England, in 1928 and the other at Paris in 1931. Accredited delegates from the United States attended both congresses. A report on the work of the 1931 congress was made to the Division at the present Annual Meeting (on the Paris congress see *Geogr. Rev.,* Vol. 22, 1932, pp. 135-140: on the Cambridge congress, *ibid.,* Vol. 18, 1928, pp. 661-667).

In addition to these committee undertakings a number of general matters fall under the head of the geographical activities of the division. A report on the International Polar Jubilee Year was read by A. J. Fleming of the Department of Terrestrial Magnetism of the Carnegie Institution (see *Trans. Amer. Geophys. Union, 12th Annual Meeting,* 1931, National Research Council, 1931, pp. 81-83, and *Geogr. Rev.,* Vol. 22, 1932, pp. 121-124). A resolution was passed expressing the Division's sense of loss at the death of Professor Albert Perry Brigham (on his work, see the June, 1930, number of the *Annals*). Among the exhibits of geographical interest were the George Washington Atlas, edited by Lawrence Martin and published by the Bicentennial Commission, and the most recently published sheets of the American Geographical Society's Map of Hispanic America on the scale of 1:1,000,000, presented by Raye R. Platt.

Another question that was discussed at the meeting was that of grants-in-aid. Beginning with the fiscal year 1929-1930 the National Research Council has had charge of the expenditure of a special fund placed in its hands by the Rockefeller Foundation to be applied in aiding research (see Reports of the National Research Council, reprinted from the Annual Reports of the National Academy of Sciences, Washington, for 1928-1929, p. 9; for 1929-1930, pp. 10-11; for 1930-1931, pp. 8-9). The policy adopted by the Council for the application of these funds has been to use them for the making of grants of moderate amounts in the aid of individual research, for such purposes as providing technical assistance, the purchase of apparatus, equipment, and supplies, and for field and collecting expenses. In the two years 1929-1930 and 1930-1931, out of a total of 315 applications within all seven Divisions of the Council 200 were granted. Of these, 28 were in the Division of Geology and Geography, of which five were for purely geographical projects.

Another source of assistance available to geographers are the James J. Storrow Fellowships in Geology and Geography, amounting to five annual stipends of $1000 each donated by Mrs. Storrow of Boston and administered by a committee of the Division. These fellowships, first available for the year 1930-1931, and renewed for 1931-1932, were all awarded for research in geology. They have again generously been made available for 1932-1933.

The activities mentioned thus far include all of the projects of a strictly geographical nature sponsored by the Division. Its

work comprises, however, a number of projects in physical geography and dynamic and structural geology of interest to geographers. Among these may be mentioned the work of the following committees: Shoreline Investigations of the Atlantic and Gulf Coasts (Douglas Johnson, chairman); Features and Changes of the Shoreline of the Pacific Coast (J. P. Buwalda, chairman); Sedimentation (W. H. Twenhofel, chairman); Tectonics (G. R. Mansfield, chairman); Submarine Configuration and Oceanic Circulation (T. Wayland Vaughan, chairman); Submarine Topography and Structural History of the Caribbean-Gulf Region (G. W. Littlehales, chairman). The deliberations of the American Geophysical Union, which, as the American National Committee of the International Union of Geodesy and Geophysics, forms part of the National Research Council and includes sections on geodesy, meteorology, hydrology, oceanography, vulcanology, and seismology, also are of much interest to the physical geographer. Its annual meeting is held generally about a week later than that of the Division (for the activities of the meeting of April 28-29, 1931, see the 400-page volume of *Transactions* published by the National Research Council in January, 1932).

The Urban Profile

EUGENE VAN CLEEF

The use of the profile for purposes of expressing characteristic elements in an urban skyline is not a new idea. Artists have long singled out conspicuous structures in an horizontal line and converted them into impressionistic representations (oftentimes silhouettes) of a city's physical form. Advertising men have conventionalized towers, spires, skyscrapers and other edifices to stamp upon the public mind an image symbolical of a particular urban center.

Some of these profiles have been so often repeated that the general public has no difficulty in instantly identifying either their exact location or the location of a general region which their form typifies. The profile of the minarets of the Kremlin suggests Moscow itself to many, and Russia to most persons; the majestic clock tower housing "Big Ben" overlooking the Thames recalls London; the stately spires of the Köln cathedral towering above the low even roof line of the noted Rhine City are familiar to thousands even though they have never enjoyed seeing them at first hand; the profile of the Taj Mahal requires no label for identification; the Woolworth "Cathedral of Commerce," in spite of high skyscrapers all about, is still a land mark which people everywhere associate with New York City's horizon. German geographers have more than once utilized aerial photography to illustrate in a perspective setting the relation of the horizon line to a city plan or to the topographic environment. A recent instance is that by Creutzburg[1] who has published a magnificent set of cultural landscape views, selected from all parts of the earth, many of which are photographic landscape profiles.

In the series of profiles illustrated herewith,[2] an attempt has been made to reduce to a minimum the impressionistic atmosphere and to eliminate details of the ground contact of the structures depicted. Likewise the topographic variations of the site have been ignored. Instead, the key characteristic of what may be termed the lower and upper horizon line are emphasized to the

[1]Nickolaus Creutzburg: *Kultur im Spiegel der Landschaft; Das Bild der Erde in seiner Gestaltung durch den Menchen: Ein Bilderatlas.* Leipzig, 1930.

[2]Figs. 1-8, pp. 240-241. These drawings were made by the courtesy of Walter Lezius, University of Toledo.

exclusion of practically all else. The drawings of the profiles were made from actual observations, scaled only approximately and viewed from a sufficient distance, about one mile, to eliminate largely minute details.

Each profile is independent of all the rest, each having been sketched by a different person. They were then brought together and reduced to a common size. Consequently comparisons of actual horizontal distances are only approximate. The characteristics of the profiles are comparable in terms of what they reveal with respect to such elements as regularity of outline, conspicuous deviation from the horizontal, architectural forms, and even general economic activity.

Eight different sized Ohio centers are represented, ranging in population from about 800 to just over 900,000. The profiles have been shown to many Ohioans for identification and have been easily recognized by the permanent residents in the respective centers, and in the instance of the larger centers, have been readily named even by those persons who have visited them only occasionally. These profiles portray the dominant structural characteristics in the vertical plane of the respective forms. Each of these profiles reveals an outline which is unique. Hence the assortment precludes exact classification in terms of a specific form. In other words, these urban centers, in spite of many elements in common, are distinctive; that is, they possess individuality. This probably is equally true for most if not all cities.

A profile may convey some impression relative to architectural evolution. For example, in the profile of Cincinnati there is visible the "block form" and the recent "setback" form in tall buildings. If the profiles be compared, we may observe a style of architecture characteristic of the 1880's in that of Troy, as revealed by the turreted and somewhat domed outlines, in contrast with the more recent hard rectangular lines of the Columbus horizon.

In any complete description of an urban center, three dimensions must be cited. These may be expressed in terms of a horizontal and a vertical plane. The horizontal plane includes areal dimensions expressed by the city plan whereas the vertical plane implies a linear dimension perpendicular for all general purposes, to the horizontal. The profile not only serves to identify the vertical plane in the urban structure but reveals the lower and upper horizons already alluded to. The relatively even roof line of the majority of buildings in the area, forms the lower horizon, and

the conspicuous features such as towers, skyscrapers, water tanks, and still other phenomena reaching far enough above the average roof line as to be distinct from it, constitute the upper horizon line. It is this latter line which is generally selected by artists as the basis for developing conventional interpretations and is the horizon which gives individuality to the urban form.

Certain weaknesses suggest themselves in these profiles. In the first place complete cross-sections of each center are not presented in every instance; perhaps they should be drawn to exact scale; the ground contact might be considered essential; more than one profile of a city is possible; industrial units are often hidden from view leaving an incomplete, not to say inaccurate, impression of the details of the center. On the other hand, the aim in delineating the profile is to depict one which in its simplest form, characterizes the center no matter what may be the direction of approach, even though in certain minute details differences occur depending upon the location of the point of observation.

In spite of these defects, the concepts conveyed by a profile are so distinctive and so impressive as to warrant reliance upon them and their utilization in the study of urban forms. Since the urban center is the climax physical expression of man's cultural attainment in a given natural environment, an analysis of its form becomes an important function for the geographer. The simplified profile, it seems, can be developed as a valuable aid in the consideration of some of the problems associated with both theoretical and applied urban geography.

FIGS. 1-8—PROFILE SILHOUETTES OF SELECTED CITIES AND TOWNS IN OHIO.

Note: The vertical scale is approximately the same for all charts. Cleveland (Fig. 1) is used as datum for the horizontal scale, the relative horizontal distance depicted in the silhouette for each of the other towns being stated in the captions below.

FIG. 1—Cleveland; population 900,429.

FIG. 2—Cincinnati; population 451,160. The horizontal distance portrayed is twice that of the Cleveland silhouette.

FIG. 3—Columbus; population 290,564. Horizontal distance 1½ times Cleveland.

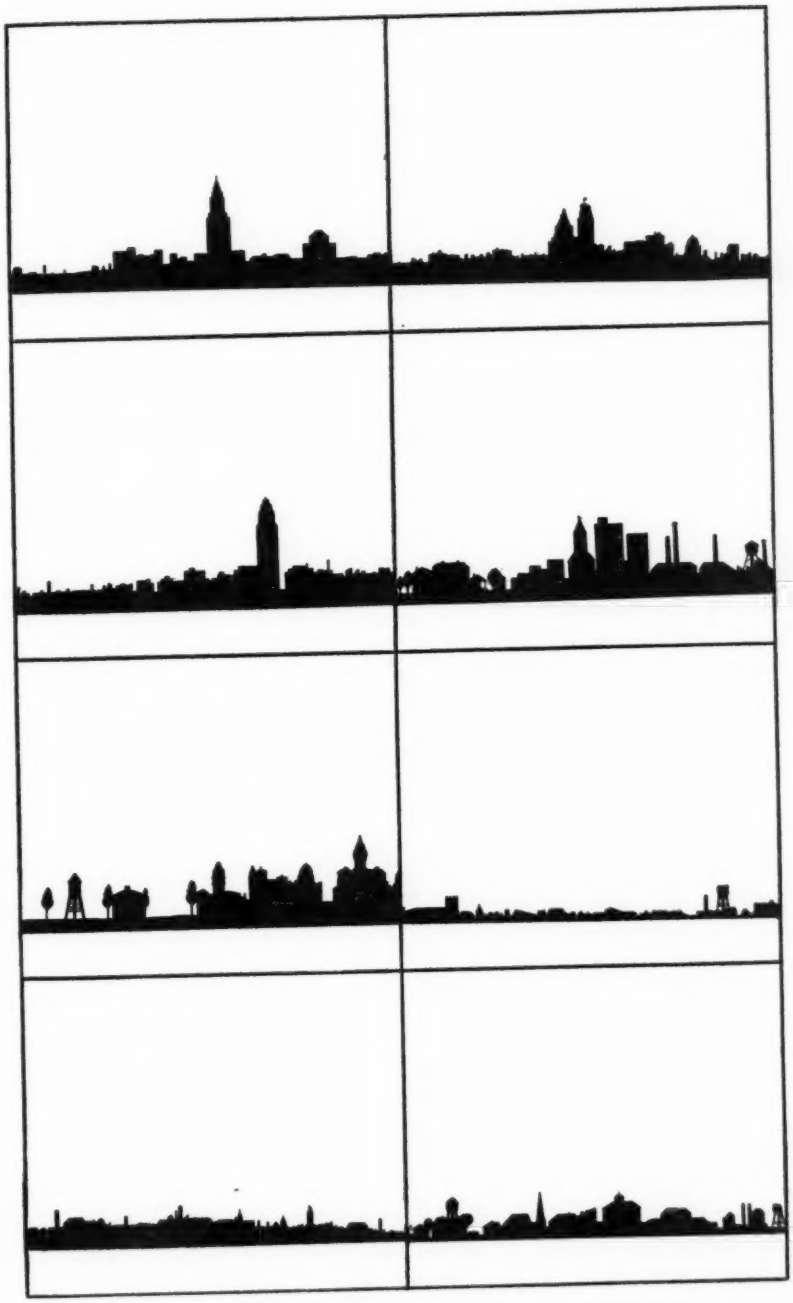
FIG. 4—Alliance; population 23,047. Horizontal distance equal to Cleveland.

FIG. 5—Troy; population 8,675. Horizontal distance equal to Cleveland.

FIG. 6—Willard; population 4,514. Horizontal distance thrice that of Cleveland.

FIG. 7—Greenfield; population 3,871. Horizontal distance twice that of Cleveland.

FIG. 8—Sunbury; population 784. Horizontal distance equal to Cleveland.



The Yamato Basin, Japan

ROBERT BURNETT HALL[1]

In the internal political reorganization of the Japanese state, following the Restoration, two aims were achieved. The first was to break the sectionalism which had grown up within the ancient provinces (Kuni) and the second was to establish divisions which would tend to equalize the distribution of resources and political power. As a result most of the newly founded prefectures (Ken) were made up of one small area of highly productive and densely populated land surrounded by wide extents of rugged and sparsely settled lands. The Yamato Basin is the fertile nucleus of Nara Ken. It contains one-half of the population and but one-sixth of the area of the prefecture.

THE REGIONAL SETTING

The Yamato Basin lies midway between the Osaka and Kyoto Plains, in the heart of the historic Kinki District. The Kinki District may be divided into three distinct geographic entities.[2] The first is the southern division which embraces the Kii Peninsula. It is a maturely dissected mountain land of high relief which receives the heaviest rainfall recorded anywhere in Japan proper, viz. 100-150 inches. This is an area of sparse population and the predominant industries are forestry and fishing. The second we may call the northern division which includes the Tamba Plateau, an uplifted peneplain in a state of mature dissection, receiving a relatively high rainfall, 80-100 inches. In general, it is a land of sparse population except for a number of broad tectonic valleys. Finally, the central division which lies between the Tamba Plateau and the Kino Valley. This is a granitic land which was once reduced to a peneplain. Later uplift and depression along the numerous meridional fault lines have resulted in a complex pattern of grabens and horsts. The uplifted blocks account for such mountain systems as Ikoma, Kuzushiro, and Kasagi. The depressed blocks underly the alluvial plain of Lake Biwa, Kyoto, Osaka and Yamato (Fig. 1). Due to the highlands of the north-

[1] Social Science Research Council Fellowship, 1929, and Social Science Grant-in-Aid, 1931, for research in human geography in the Japanese Empire.

[2] Ogawa, T.: *Land and People in the Kinki District*, 195, Tokyo, 1928.

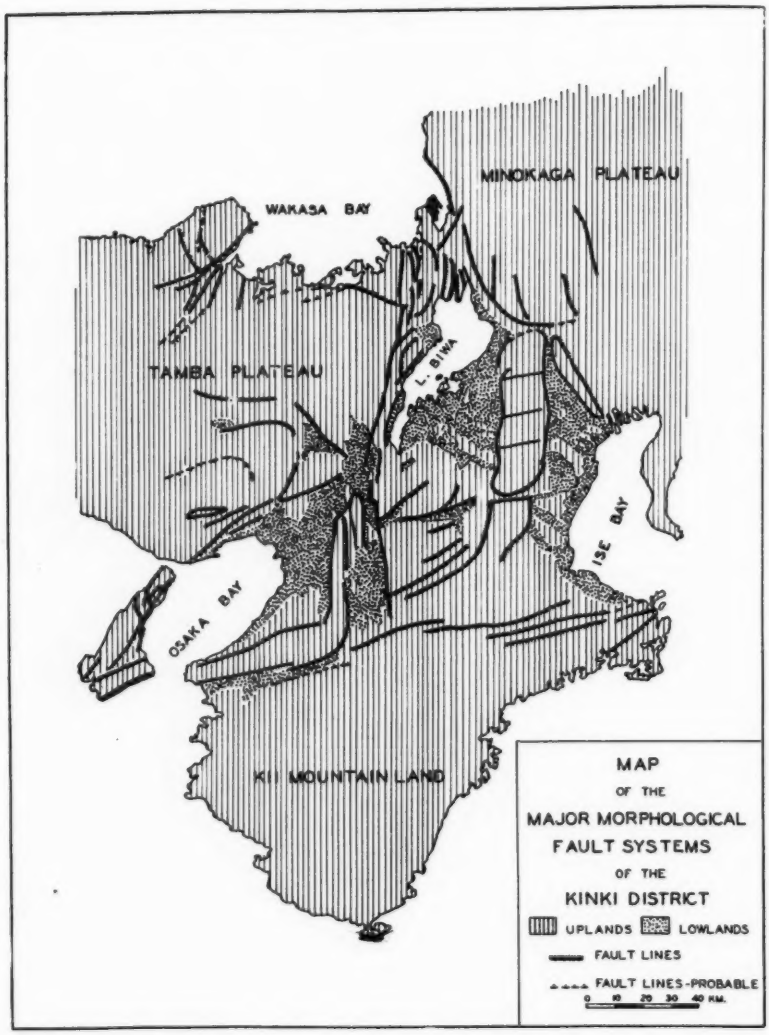


FIG 1— The Surroundings of the Yamato Basin. The Osaka Plain borders Osaka Bay, and is separated from the Yamato Basin, which lies directly eastward, by the Kongo Mountains. (*Cf.* Figure 4).

ern and southern divisions this central district has as low a rainfall as any part of Japan proper (Fig. 2). Fortunately the maximum precipitation occurs during the summer months. All of the important rivers of the district flow through one or the other of these basin depressions. Irrigation is made possible in this way and is supplemented by summer rains. The fertile alluvial soil of the basins is thus diverted to vast paddy fields. These basins, then, afford the most densely populated agricultural lands in Japan (Fig. 3). In every respect they are favored by nature and in them much of the history of Japan has been written. Today, as in the past, the central region of the Kinki District is the most important part of Japan—economically, politically and culturally.

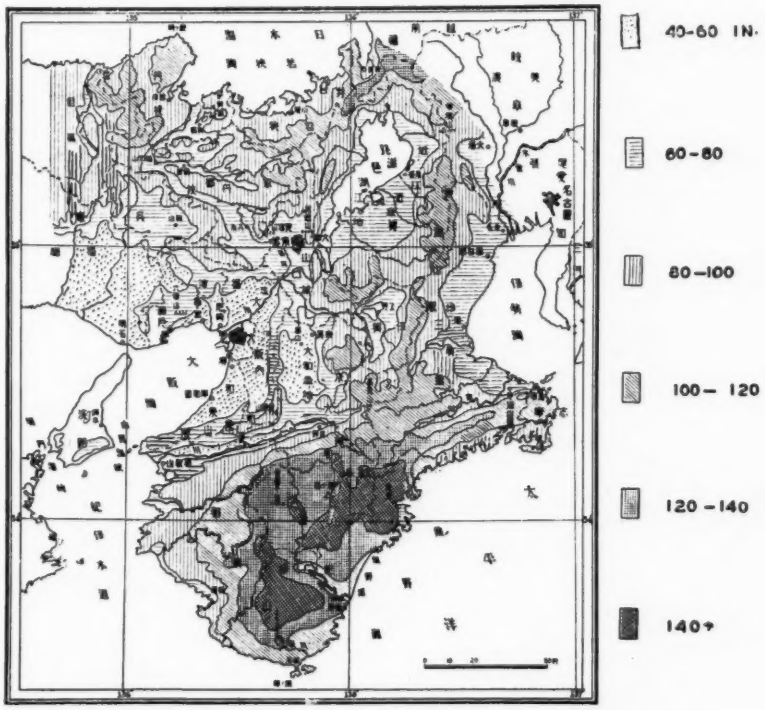


FIG. 2—Average Annual Rainfall of the Kinki District. After T. Ogawa.

GEOMORPHOLOGY

Natural Land Forms.—The Yamato Basin lies almost in the exact center of this central district (Fig. 4). It is a conspicuous, oblong-shaped fault basin, depressed well below the surrounding granitic mountain lands. Its maximum length, from north to south, is nearly 30 kilometers and its maximum width, from east to west, is nearly 16 kilometers. Most of the basin floor lies between 50 and 60 meters above sea level. The margins rise to about 100 meters, and a small area near the outlet of the Yamato River is below 40 meters. The surrounding mountain lands all bear remnants of former peneplanation. It is believed that, in late Tertiary time, after base leveling was completed, a strong uplift took place. At the same time, or somewhat later, faulting occurred and the present outline of the basin was complete.[3] The eastern and western boundaries are nearly meridional in direction. To the west is the horst of the Kongo Mountains.[4] On the east is the conspicuous Kasuga fault line which also forms the western boundary of the Kyoto Plain. After the depression mentioned, the floors of the Yamato and Kyoto basins lay below sea level and were continuous. They were occupied by the one great lake whose outlet was the Yodo River, which now connects Kyoto with Osaka. A secondary outlet flowed between the Ikoma and Kongo mountains. This is now dry, as it is blocked by the small, massive volcano of Nijo-san (Plate 1). On the Kyoto Plain, the lake of Ogura-no-ike is a remnant of this former great lake. There are no remnants on the Yamato Plain.

Bordering the Yamato Basin on the east is the Yamato or Kasagi mountain land. In reality, this is a maturely dissected plateau. The crests are broad and display the low relief of the former cycle. They are also of the same altitude, *i. e.* 400 to 500 meters. The descent from the plateau into the basin is marked by a bold and maturely dissected escarpment, which is attached to the basin floor by diluvial terraces and composite alluvial fans, also in a stage of mature dissection. In the northeast corner of

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[3] Tsujimura, T.: *The Regional Physiography of Japan,* 47 ff. Tokyo, 1929. (In Japanese.)

[4] See Cushing, S. W.: "Coastal Plains and Block Mountains of Japan," *Ann. Assn. Amer. Geogrs.* 3, 1913, 43-61; and Tsujimura, T., "The Nature of Fault Valleys and Geomorphologic Fault Structures of a Portion of the Japanese Islands," *Geog. Rev. of Japan* 2, 1926, 132-152, 192-218. (In Japanese.)

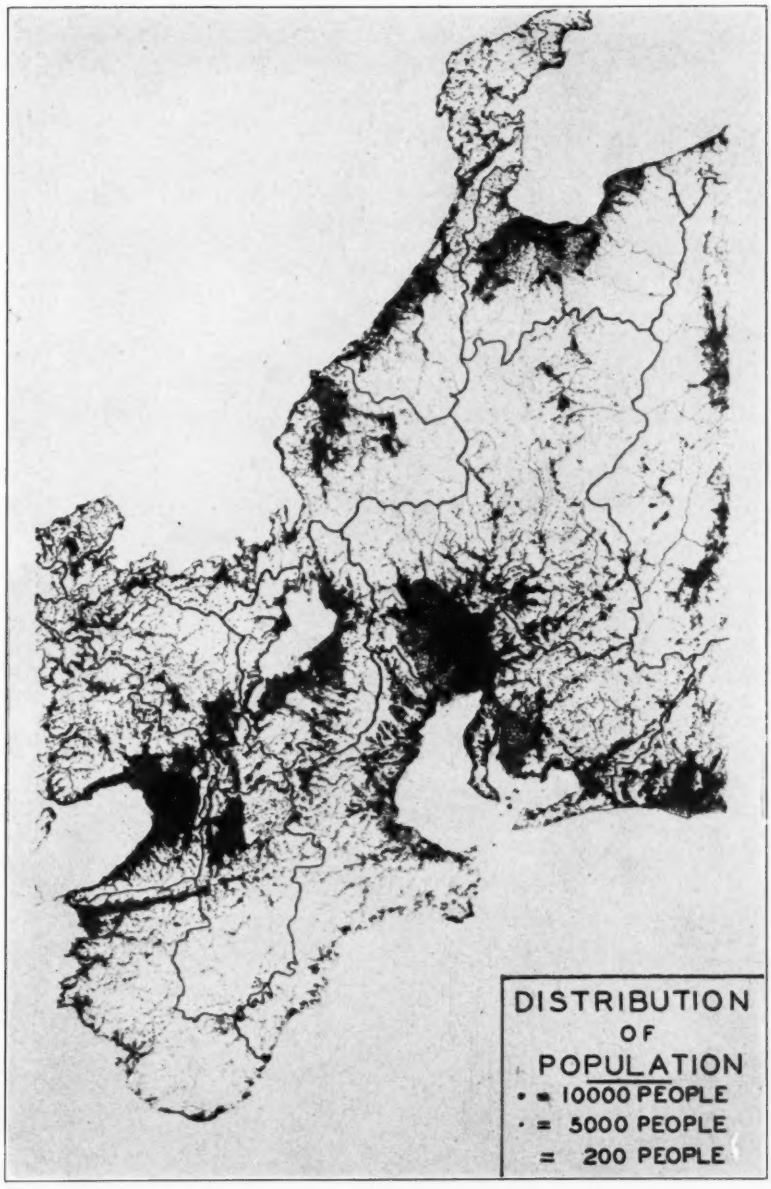


FIG. 3—Population of Central Honshu. After Prof. Tanaka.

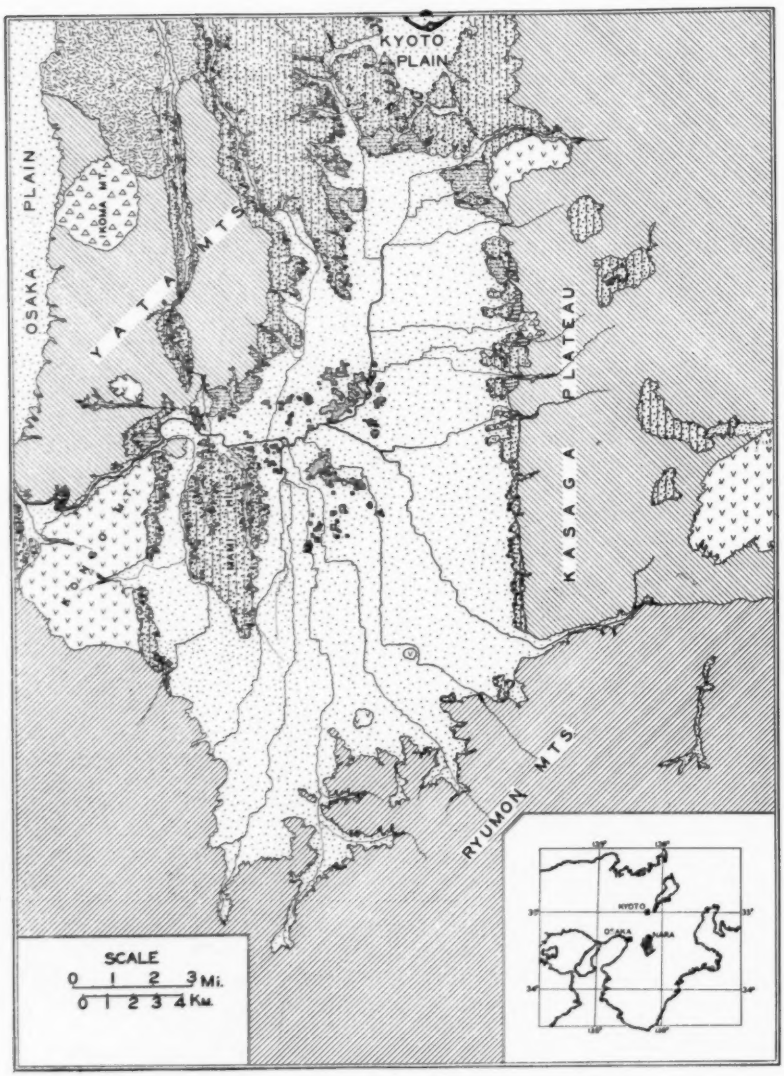
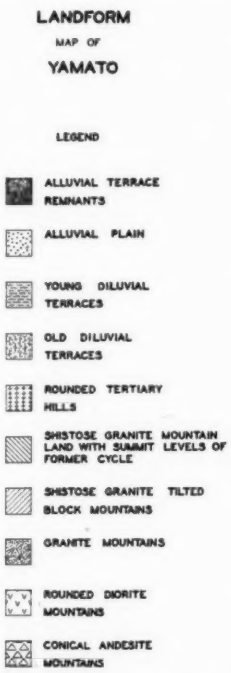


FIG. 4—Landform Map of Yamato.



the basin, is the massive volcano of the Mikasayama, which towers above Nara City—bold, grass covered, and picturesque.

Westward, the basin is separated from the Osaka Plain by a meridional block range of granitic rock. This range is divided into two parts of somewhat dissimilar physiographic features by the antecedent gorge of the Yamato River. The northern portion is known as the Ikoma range after the dioritic peak of Ikoma-san which forms its highest point. The system is, in fact, composed of three tilted blocks whose major axes are north-south and parallel to each other. Their block fronts all face westward and their back slopes descend gently toward the Yamato Plain (Fig. 5). The westernmost and highest is the Ikoma range proper, which descends to the Osaka Plain by a conspicuous fault scarp. On its crest are found remnants of the former cycle. The fault valley of the Ikoma River separates this range from the Yata mountains to the east (300 meters), while the valley of the River Tomio lies between this latter range

FIG. 5 — Graphic Relief of Yamato. After a model in the museum of the Nara Higher Normal Schools for Girls.

and the diluvial covered Nishinokyo. The latter overlooks the western margin of the Yamato Plain. The back slopes of all three blocks carry diluvial terraces. The southern portion is known as the Kongo Mountains and is a distinct horst. Both its eastern and western margins are marked by abrupt fault scarps. The eastern scarp faces the Yamato Plain and has a fringe of composite alluvial fans at its foot. Here, too, remnants of former peneplanation are found on the crests. Along the southern margin of the plain, the maturely dissected back slopes of the Ryumondake-tilted-block gradually merged into the basin floor. This boundary is, in consequence, richly indentured and wide, waste-filled valleys penetrate far southward into the Ryumondake mountain land. Many outlying low hills of granite and andesite protrude from the plain. The small volcanoes of Unabi and Miminari are conspicuous and it is believed that they once were located at a higher level and have been depressed. The result is that their lower slopes are now deeply buried in the alluvium of the Yamato Plain. Between the southern end of the Kongo range and the Ryumondake mountain land is a low pass, which forms an important line of communication to the Kino Valley. Likewise, between the Kasagi Plateau and the Ryumondake Mountains is the historical fault valley through which the first emperor and his Yamato tribesmen are said to have entered to conquer and name the basin.

The Yamato Basin has remained mobile to the present day. Alternating depression and uplift have taken place. Remnants of older basin deposits are found along the margin of the northern two-thirds of the plain. They occur on two distinct levels as maturely dissected terraces. The upper terrace is composed largely of sand and gravel, is somewhat distorted, and is strongly eroded. It will be referred to as the Old Diluvial Terrace. The lower is of finer material, largely marine clay, is not disturbed and is less eroded. This will be called the Young Diluvial Terrace. The former is much more extensive and accounts for the broad belt of hills called the Narasaka, which now separates the Yamato and Kyoto plains.

The largest single area of young diluvial terrace is occupied by the city of Nara. In general, the older terraces exceed 100 meters elevation, while the younger ones are less than 100 meters. A few low, rounded hills of Tertiary shales protrude slightly above the adjacent terraces on the eastern margin of the plain.

Below the 50-meter contour line near the outlet of the Yamato River, are patchy terrace lands of old and somewhat leached alluvium, which rise one to four meters above the adjacent floor. These are probably due to recent sibsidence in Osaka Bay, where the Yamato River reaches the sea. They may possibly represent the old flood levels of the river before so much of its water had been diverted for irrigation. The basin floor proper is extremely level and monotonous. It is composed of recent alluvium and is highly fertile. It constitutes one vast rice field whose only limitation is the amount of water available. What has been said thus far applies only to the natural land forms of the Yamato Basin and associated lands.

Culturally Induced Land Forms.—Where man has altered the surface of the earth as effectively as he has in this area something should be said of the culturally induced and altered land forms. We will hereafter confine our attention to the basin floor and reference to the adjacent lands will only be made as relationship demands. All hills out on the plain and many of the marginal hills are either artificial or have been greatly altered by man. This is due, primarily, to the practice of tomb building among the early emperors and nobles. At first they built small mounds over tombs which were located on natural hills overlooking the plain. The early ones are located in the southern end and the later ones occur along the northern margin. At a still later date artificial hills were built in some instances well out on the plain. Some attain elevations in excess of 35 feet and several are more than 350 feet along their major axes. When these are covered with mature trees they become very conspicuous forms in the landscape. These tombs are of three forms. The first type, of the fourth and fifth centuries, is three-stepped and of elongated form. Each tomb is surrounded by a single moat, and the elevation of the top level seems to have been about 27½ feet. The second type developed in the following centuries. It is oval in shape and is often surrounded by several moats. This type is composed of three steps, the top level reaching about 22 feet. The third type followed and is square. It has four steps, the top one reaching to about 34 feet. The form of the tombs for emperor, empress, or prince is identical. The emperor's tomb is the largest, except during the period of matriarchy. For example, the tomb of the Empress Jingo, Conqueror of Korea, is larger than that of many emperors. Until the time of the Emperor Suinan, generals and

other officials were buried alive in small tombs which formed a circle about the imperial tomb. After the time of the Emperor Suinan this halo of small tombs persisted, but stone men, monkeys, turtles and so forth were buried in them in place of living persons. There are about one hundred recognized major tombs in the Yamato Basin, and many more which have not been identified. There are several tombs of the same types on the Osaka Plain near Sakai. There are several in Kyushu, especially in Hyuga, the birthplace of the Yamato tribe. Contemporaneous tombs near the vicinity of the old Korean capital of Kyushu are quite similar in form to those of the Yamato Basin. Round dolmens of considerable size are also found in Izumo. During the Shogunate the power of the emperors became weak and the tombs were desecrated and their original forms were altered. Their moats were drained to make paddy lands and their slopes were planted in dry crops. In many instances their tops were altered for fortifications. Now that the imperial line is again strong the destruction of the tombs is prohibited. If existing tombs are identified as either of an emperor or empress they have become national shrines. Around them gravel walks have been made beneath impressive torii. In some cases extensive parks have been added. Their ancient moats have been reconditioned. Trespassing is prohibited and the tombs have become bird refuges and carry a varied and luxuriant vegetation. If a tomb cannot be identified it is officially ignored. The slopes are planted in crops and are often terraced. The moats are being reclaimed or are used for fish culture. The highest point is invariably the site of a local shrine.

Man for untold centuries has been endeavoring to enlarge the area for paddy fields. Where diluvial terraces border the plain or where the remnants of alluvial terraces occur, their bases have been persistently attacked. The result is an extension of the alluvial level and a contraction and deformation of the terrace margin. Many table-like terrace remnants are found, often far out on the alluvial plain, which are rectangular in form and are still being reduced in size. Box-like valleys extend far into the terrace land and these are slowly being lengthened and broadened. A considerable proportion of the present alluvial level has been culturally induced. Although the Japanese have nowhere developed artificial terracing to the degre found in more southern lands, lower slope and valley terracing is well developed in the Yamato Basin.

This is a distinct alteration of natural land forms. Still another change has taken place in recent years. The growth of Osaka and other nearby industrial towns has afforded a market for fruits and vegetables. The Yamato Basin does not have enough water for the optimum irrigation of its rice fields and many farmers have built small rectangular fields about one meter above the rice level. Thus the water used by farmers can be concentrated on the smaller areas and the fruits and vegetables of the dry fields act as a money crop.

Natural and Culturally Induced Drainage Forms.—The Yamato Basin floor is subject to violent floods in the late summer months. To protect his fields, man has built an intricate system of large and small dikes. These vary from one to five meters in height and definitely alter the landscape.

The entire drainage system of the Yamato Basin is controlled by the Yamato River and its tributaries. These streams have all entrenched themselves below the level of the plains. They carry, normally, but a small percentage of the water which their channels could handle. This is due to the fact that they are tapped by canals at points in the surrounding mountain lands which afford enough fall to allow irrigation on all parts of the basin floor. Some of the canals lead directly to the fields. The vast majority, however, lead to numerous, small rectangular storage ponds which are scattered over the plain and on the diluvial terraces. The water of the Yamato River and its tributaries is the life blood of the plain and the gift of the surrounding uplands. Without it, rice cultivation would not be possible, as the rainfall is low. The precipitation is distinctly seasonal and as the many short streams of the mountain land descend steep slopes and occupy narrow valleys, floods are frequent and disastrous. Great levees have been built to minimize this danger and they constitute a conspicuous form of the terrain. In the case of the drainage forms, as of land forms, man has wrought profound alteration. Entire courses have been changed and straightened to aid in the flood control. Drainage patterns have been altered to fit the rectangular system of land division and roads of the "Handen" or land system which was borrowed from China many centuries ago. In consequence, streams often flow on straight east-west and north-south lines and their bends often form right angles. Tributary streams enter the main streams at right angles. A maze of large and small irrigation ditches fit into this artificial, rectangular pat-

tern, as do most of the nearly countless irrigation ponds. Thus, we have the ground upon which untold millions have toiled and died.

CLIMATE AND THE SEASONS

Climate and weather complete the stage setting for the settlement and other cultural forms which have developed upon it. Climate is not a visible object of the landscape in most of its manifestations. To the geographer, climate is of interest chiefly as it affects the form and structure of the areal scene. Unfortunately in most geographic studies the weather of a single period or season, alone, has been considered. We recognize the constantly varying aspect of land in terms of space, but we have seldom paid much attention to the ever changing, yet cyclic aspect of the land in terms of time.

The climate[5] of the Yamato Basin may be described as having a hot summer and a cool winter. The average growing season is about six and a half months and extends on the average from April 24 to November 8. Frosts occur during the remaining months, that is, from November 8 to April 24. The average year has 84 frost days, but no really severe temperatures occur. The average year has 18 days of snowfall, but rarely is there a heavy snow accumulation. The maximum accumulation on record is 9.8 inches which occurred February 12, 1909. Precipitation is low for Japan—averaging from less than fifty inches to nearly sixty inches in different parts of the basin. The summer monsoon, which brings heavy rains to the Pacific side of Japan, is effectively cut off by the mountains of the Kii Peninsula and of Kasagi. The winter monsoons, which bring heavy snows to the Sea of Japan side, are shut off by the Tamba Plateau and adjacent uplands. Fortunately, the maximum of precipitation occurs during the growing season and evaporation is low. 67% of the annual precipitation occurs during the six months of April to September inclusive. The relative humidity is then high and there is much cloudiness. The early summer rains come when the new paddys need it most. This is the season of the "baiu" or plum blossom rains. The later summer rains are caused largely by the typhoons.

Spring.—Spring weather is generally mild, and soft north or west winds blow most of the time. The relative humidity is low and there is a good deal of sunshine. The traditional dawn of

[5] Cfa of Koeppen.

spring comes with the first song of the nightingale. This occurs in the ordinary year about the first of March. There are, however, still 14 frost days ahead and some light snows. The plum blossoms and rape flowers burst out toward the end of March and the landscape has taken on a definite spring greenness. At the end of March, the first swallows appear and the country houses are thrown open so that this bearer of good luck may build its nest in the beams of the kitchen ceiling. The landscape changes rapidly now, the hillsides and dry gardens become green with freshly budded tea and mulberry plants. In the middle of April the famous cherry blossoms of Nara bloom. Thus far, there is little demand for labor and few people are seen in the fields. During the long winter months, in fact since about November 20, the rural folks have stayed close to the "hibachi" and hot tea. As spring gets under way and just before the planting season starts the pilgrimages begin. Thousands, tens of thousands and even hundreds of thousands of pilgrims pour into Nara and the Yamato Basin to visit the ancient temples and shrines and other antiquities. The few days when the cherry blossoms bloom are most popular. At this time the basin appears as one vast field of canary-colored rape flowers (Plate 2). The peach blossoms of the central part of the plain also attract their thousands. The rice lands are everywhere green with fall sown wheat and barley (Plate 3). Nara contains the home temples of most of Japan's Buddhist sects. It contains likewise the most ancient and famous objects of Shinto worship. Thus during this season the city of Nara is packed to overflowing. The electric interurbans carry unbelievable numbers, and dusty lines of the devout tramp the country roads. Outside of rice production the pilgrim business is the most lucrative industry of the Yamato Basin. However, April 20 or 21 sees a sudden cessation. The time to begin work has come. The farmers appear in their fields and everywhere there are signs of industry. Rice seed is seen soaking in every kitchen and the seed beds are being carefully prepared. Soon the seed bed must be planted. The watermelon hills must be elaborately shaded and white, sweet, and Japanese potatoes are set out. Half the days are rainy. Nara's justly famous wistaria blooms about the middle of May and lasts, unless heavy rains occur, for ten days. The spring silk crop is started. All is activity. Toward the end of May the days become hot and the closely sown beds appear as dark green lawns. The rape crop is now harvested

TABLE I.—The Cycle of the Seasons.

SPRING

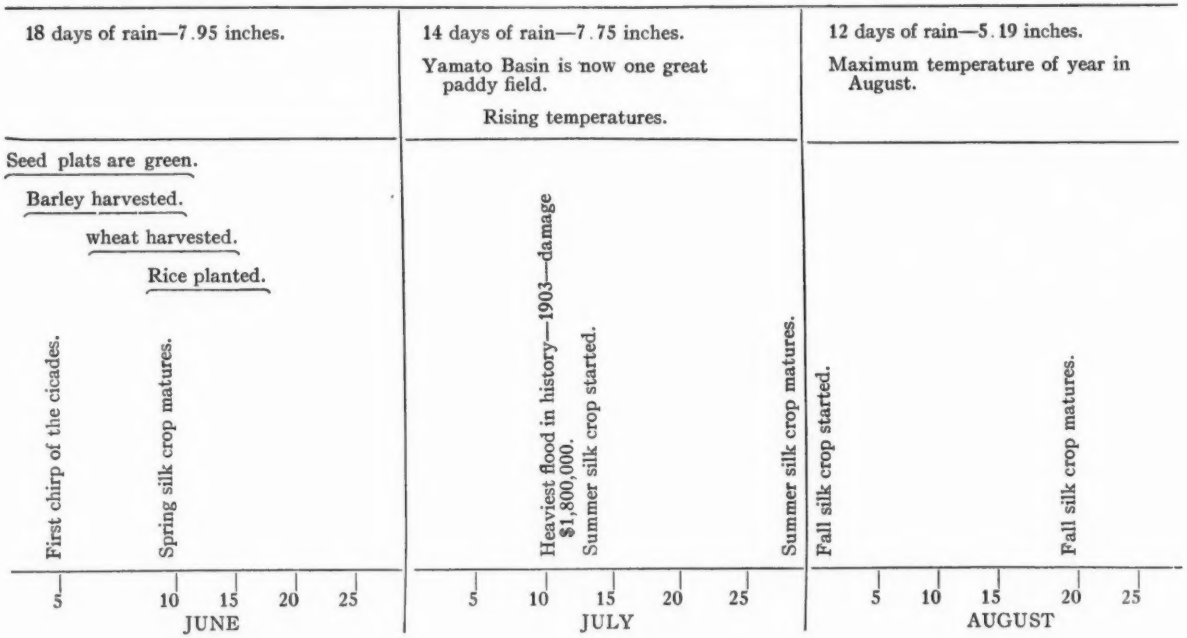
Weather generally mild—Soft N. or W. winds blow in this season.
Mean temperature, 53.8°F. Average relative humidity, 76%. Total precipitations—13.4 inches.

MARCH	APRIL	MAY
15 days of rainfall.	14 days of rainfall.	13 days of rainfall.
14 frost days.	Green wheat and barley occupy the rice lands.	Wheat and barley mature on rice lands.
Period of rest—Pilgrimages—	Household Chores.	
	Chief religious pilgrimages.	
First song of the Nightingale.	Planting of watermelons.	Rice sown broadcast, if no seeds beds, or put in paddy.
Last snowfall in average year.	Last day when temperature goes below 32°F. in average year.	Azalias in full bloom.
Plum blossoms and rape flowers.	Tea leaves sprout.	Spring silk crop started.
First coming of the swallow.	Watermelon hills sanded and fertilized	Latest frost on record.
	Cherry blossoms.	First fire-flies.
	Mulberry leaves sprout.	Mosquito nets now needed.
	Rice seed put to soak.	
	Last frost of the average year.	
	Preparation of seed beds for rice.	
	Rape seed in full bloom—potatoes planted.	
5 10 15 20 25	5 10 15 20 25	5 10 15 20 25

SUMMER

Early summer frequent showers and high humidity—Late summer hot and muggy with violent rains.
Mean temperature 76.28°F. Average relative humidity 79%. Total precipitation 20.9 inches.

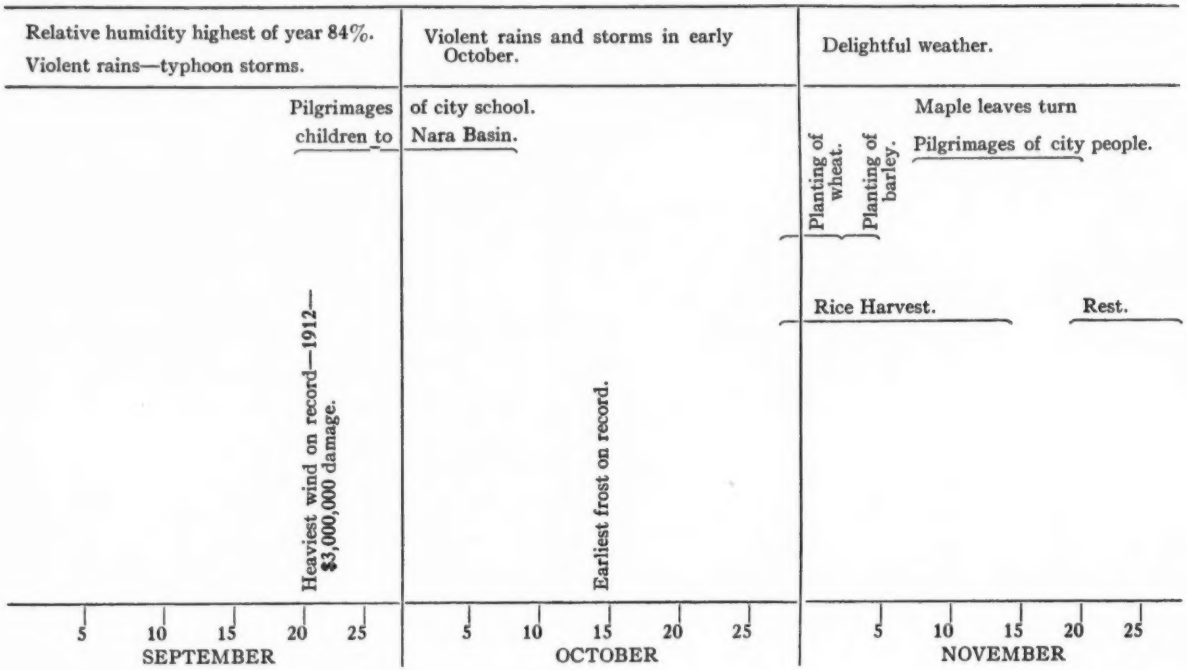
"Baiu" or Plum Blossom Rains. Season of floods.



FALL

Early autumn has heavy rains and temperatures drop rapidly.

Mean temperature 60.8°F. Relative humidity 82%. Total precipitation 16.96 inches in 41 rainy days.

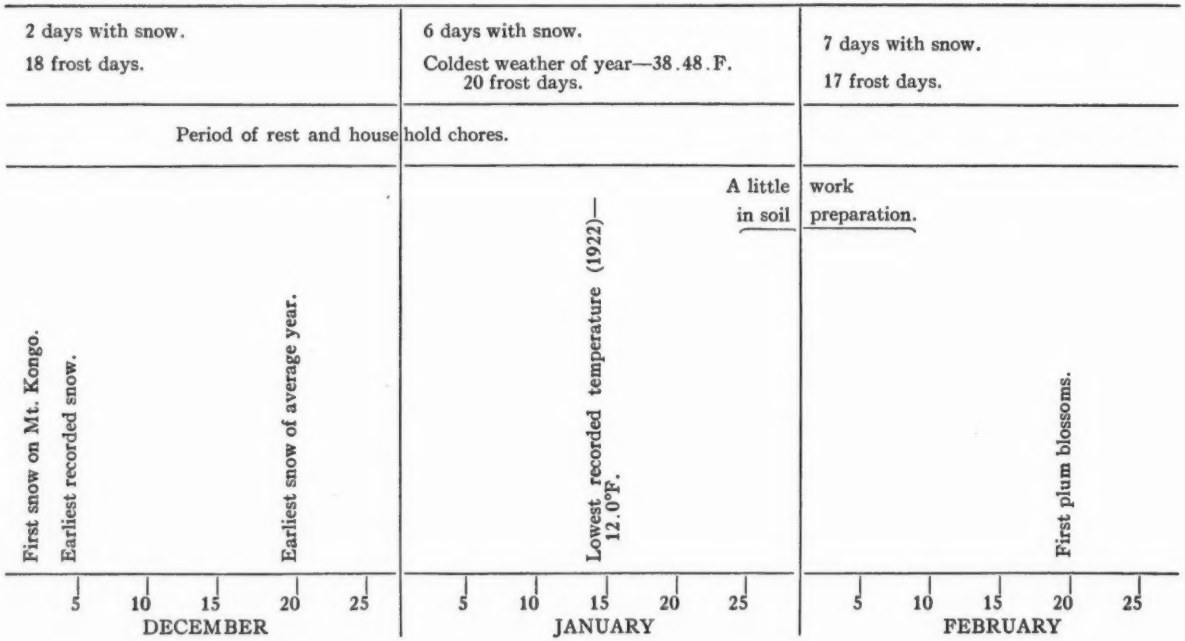


WINTER

North and west winds prevail—air is dry—Lowest precipitation of year.

Mean temperature 39.9°F. Average relative humidity—77%. 36 days of precipitation with snow on 15 days.

Period of rest and household chores.



and the smoke from the burning stalks can be seen in every direction. At night myriads of fireflies appear to the delight of the children who catch them to light their paper lanterns. Less pleasant are the mosquitoes which find abundant water in which to breed. The ditches, ponds, and planted fields seem alive with frogs, and their croak is incessant from the first of May to the end of September.

Summer.—Early summer is a time of frequent showers and high humidity. The barley and wheat fields are now mature and the fields are brown. The harvest begins. The barley ripens a few days before the wheat and can be more certainly cut and threshed, before the "baiu" rains get fully started. For this reason and because the yields of wheat are smaller, much more barley is grown. The spring silk crop matures amid the demands of the fields. Sometime between July 10 and 16 countless thousands of white storks come into the Yamato Basin from Chosen to feed upon the frogs in the paddy fields. Until the end of December they stand as sentinels in every paddy in the entire basin. As soon as the land is cleared of the dry grain crops the fields are plowed, levelled, and flooded and the rice plants are set out. During this operation it usually rains most every day. From the latter part of June until early November, the Yamato Basin is one great paddy field. The land is thus made to yield two full crops. After the first flooding, the dikes are planted in a variety of legumes. Temperatures rise rapidly now and vegetative growth is speeded up. The relative humidity averages 79% for the summer period and the sensible temperature is very high. Violent rains, caused by the typhoons, begin in July and frequently cause great damage. The silk crops come close together in hot weather as the silk worms mature more quickly. However, the mulberry leaves are coarse and the worms are subject to disease. The yields are considerably lower than the spring crop.

Fall.—Early autumn is the most disagreeable time of the year. The relative humidity reaches an average of 84% in September and the temperatures are high. Violent rains continue with accompanying floods. Due to the hot, muggy weather of this period, schools all over Japan are closed for a while and a great pilgrimage of children takes place. They come from all parts of Japan and pack the inns of Nara. The rice begins to turn brown in early October and is ready for harvest by the first of November. The weather is now dry and pleasantly warm. This

is the most delightful time of the year in the Yamato Basin. As soon as the rice crop disappears from the fields, barley and wheat are planted. Wheat is planted where early varieties of rice mature and barley, due to its shorter growing season, is planted on the fields of late varieties. This is another particularly active period, but it is pleasant to be outdoors. Rape is planted ten days later than barley. A third pilgrimage takes place in middle November. This is less important than the two previous ones. It is made up chiefly of city people who are attracted by the maple leaves of the Kasagi Plateau and the chrysanthemums which bloom in the western part of the basin, especially in the Ikoma Gun. For the country folk this is a time of festivals and thanksgiving.

Winter.—Winter is announced by the first snow on Mt. Kongo early in December. Temperatures drop rapidly and night frosts occur. Soon the fields are brown and bare and the country folk close themselves up in their houses. There is virtually no work to be done during the winter and the entire plain gives the impression of deadness. Several light snows occur during the winter but temperatures are not really severe. In occasional years there may be a snow accumulation of from six to eight inches. This is considered a deep snow and never lasts long. However, the Japanese house with its heat equipment does not guarantee comfort. Toward the end of March the first plum blossoms are seen and a new spring is heralded.

REGIONAL ECONOMY

The economy of the Yamato Basin is dominantly an agricultural one. This is reflected in the fact that 80% of the population is engaged directly in agricultural pursuits and that an additional 10% is supported indirectly by agriculture or by part-time farming. 70% of the Basin's population live in distinctly rural villages or on farmsteads while at least one-tenth of the urban population in such towns as Koriyama are farmers and even an appreciable number in the city of Nara till the soil. Rice is by far the most important crop and occupies 90.1% of the cultivated land (Table 2). Rice occupies all land which is capable of producing it. Wherever water is available and wherever land is naturally level or can be made level reasonably by man it is employed for paddy. Rice pays more per unit of area than any other crop in Japan except certain specialized products such as high-grade tobaccos,

fruit, and commercial flower gardens. Rice is the all important sustenance crop of the people of Japan and is the major basis of life in the Yamato Basin. A long period of occupation and the untold millions that have toiled to extend the paddy area has made possible this large percentage of paddy land. An extremely intricate irrigation and drainage system has been developed and large areas of artificially level land have been brought in.

TABLE II—COMPARATIVE AGRICULTURAL DATA FOR THE YAMATO BASIN (JAPAN), AS A WHOLE, AND FOR SELECTED PREFECTURES.

Data for Prefectures for 1928 after H. Nasu, "Agriculture and Mining Industries in Japan," Tokyo, 1928.

AREA	% of land area (arable)	% of arable land in paddy	Yield of rice per tan (Kohu)	Index No.	Value of paddy land per tan (Best) (in Yen)	Tan of arable land per agricultural family
All Japan.....	15.8	58.7	1.833	100	712	10.9
Nara Prefecture....	11.5	77.0	2.285*	125	760	6.9†
Niigata Prefecture..	....	70.0	1.723	94	606	12.4
Kagoshima " .	....	27.0	1.432	78	746	10.3
Yamato Basin.....	78.2	90.1	2.500	130	760	6.6

*Highest average yield of any prefecture except adjacent Osaka which had 2.345.

†Smallest of any prefecture.

Japanese units of measure and value referred to in this study may be converted into familiar units as follows: 1 yen—*ca.* $.498. 1 cho—*ca.* 2.45 acres. 1 tan—*ca.* .245 acres (1-10 cho).

Table II indicates the importance of this crop for Japan as a whole, for selected provinces, and for the Yamato Basin. That the Basin is well suited for paddy production is shown in the same table where the yields per tan exceed those of any other part listed. The improvements made on the land in the way of irrigation and levelling, the long period of experience which the dwellers of the basin have had, and the great pressure of population upon the land which leads to the most intensive form of agriculture are responsible for this high yield. Similar conditions prevail in the other lowlands of Kinki District. The value of land, it will be noted in the same table, corresponds closely to the rice yield. Rice is so important a crop that all land which can be levelled and irrigated is planted in it, largely regardless of soil. Centuries of constant cropping have depleted the natural fertility of the most fertile soils. The fertility must be added each year by night soils and commercial fertilizers. In a number of studies made, 60% of the value of the rice crop was spent for fertilizer. Probably the entire plain would average more than 50%. Large quantities of Manchurian soy bean cake is now used and is a conspicuous element about every farm. In pre-Restoration days, the

houses of Yamato all had a toilet adjacent to and available from the street. These are rapidly disappearing but are still of frequent occurrence. A complex system of marketing exists so that the night soil of the larger towns is made readily available to the nearby farming villages. In short, there is no waste of organic material. Such practices, of course, exist throughout the rice lands of Japan but are more intensified in the Kinki District than elsewhere on account of the longer period of constant cropping and the greater population density.

IRRIGATION

Fertilizers can be purchased from distant lands in the present day of modern transportation, but the water necessary for rice culture must depend upon the bounty of the local environment. Water is the most important factor in determining the area available for rice. Unfortunately, the rainfall of the basin is among the lowest recorded in Japan. Rice demands, during its growing season, an amount of water approximately 270 times the volume of the crop. An acre second, during the growing season, requires .606 liters of water. As only .23 liters are made available from the average rainfall, .346 liters must be added by irrigation. In other words, 53.7 cubic meters of water are needed every day for every acre of paddy land. This would require a drainage area several times the paddy area to supply the water directly. Direct irrigation is wasteful and due primarily to improper temporal distribution. Therefore, the construction of storage ponds is essential (Fig. 6). A study of the adjacent Osaka Plain indicates that ten times the drainage area of that plain would be necessary to supply adequate water by direct irrigation but by the use of ponds this is reduced one-half. The same condition holds for the Yamato Plain. Fortunately, the basin is surrounded by highlands which receive a relatively abundant rainfall and where there is little demand for surface water.

The Yamato River and its several tributaries rise in these highlands and flow across the basin floor. So completely are these streams utilized in the Yamato Basin that by the time the main stream reaches the Osaka Plain it is virtually dry during the summer months. In periods of flood it constitutes the only drainage outlet for the Yamato Plain. The following table gives some idea of the complete irrigation structure:

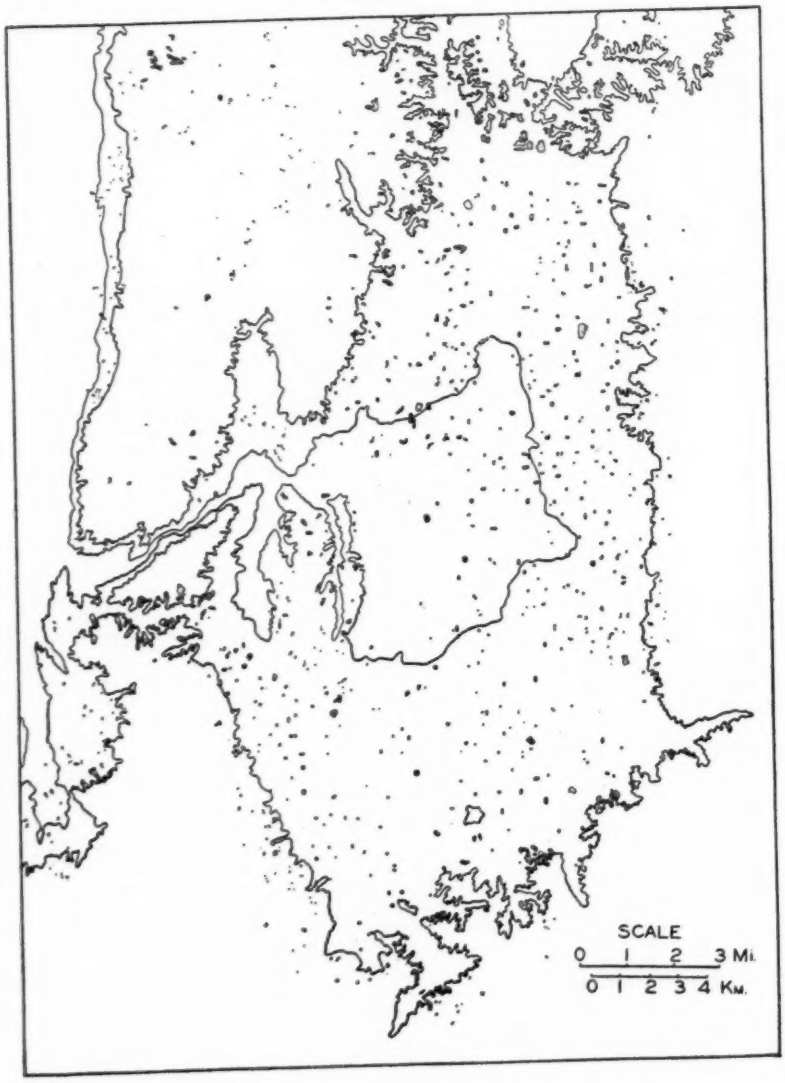


FIG. 6—Principal Irrigation Tanks, Yamato Basin.

TABLE III

Total area irrigated	55,798.75	acres
(70.9% of all land below 100 m. contour)		
Area irrigated by ponds	40,412.75	acres
(72.4% of irrigated land)		
Area irrigated directly by rivers	14,442.75	acres
(25.6% of irrigated land)		
Area irrigated by wells	943.25	acres
(1.6% of irrigated land)		

In general, the border areas nearest the highlands from which the streams enter the Basin have the largest percentage of land irrigated directly by the river. This is primarily because the stream can be tapped nearby on a higher level. The central portion has the largest amount of pond irrigation, largely because

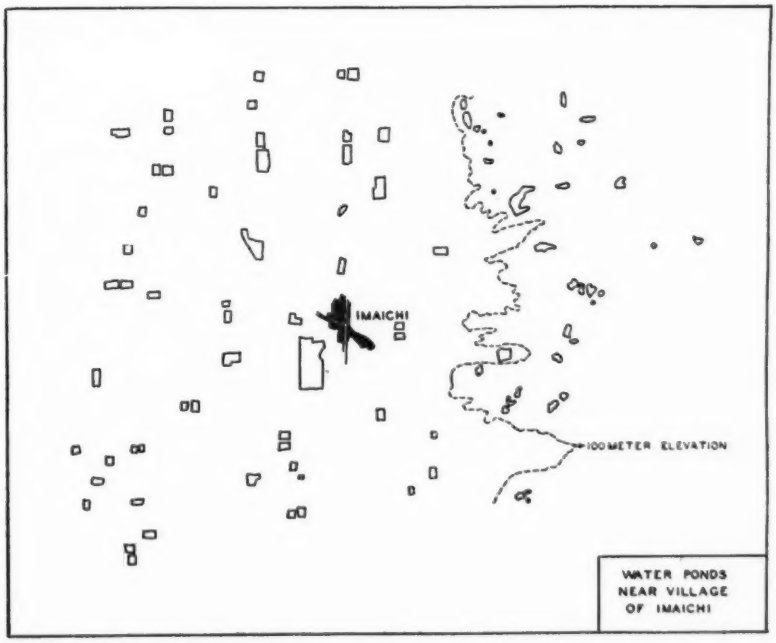


FIG. 7—A Detail of Irrigation. Young diluvial terraces lie to the east of the 100-meter contour and alluvial plain to the west of it. Note the rectangular form of the ponds on the alluvial land.

the streams are entrenched several meters below the plain level and because the streams have already been relieved of much of their water. The ponds are filled by canals which tap the rivers above the borders of the plain and by the run-off of local areas. Filling is not direct in many cases. A system of ponds locally named "mother and child" is found. The larger, higher level pond frequently feeds several smaller ponds near by. These secondary ponds in some cases feed another set of still smaller ponds. The ponds on the basin floor are distinctly rectangular in form while those of the border lands are irregular in shape and conform to the rougher conditions of the land surface (Fig. 7). The alluvial terrace land below the 50-meter contour line is virtually the only area which is irrigated primarily by wells.

The entire landscape bears evidence of the complex and thorough system of irrigation which has been developed through the centuries of occupation of the Yamato Basin. There are 10,056 ponds which occupy an area of 4,694 acres. Of these 6,002, which have an average size of .64 acres, have individual names. The remaining 4,654 average .2 acres and are unnamed. Embankments and ditches will add at least 2500 more acres. The picturesque forms of well irrigation will be described later.

The Yamato Basin may be divided into the ten following irrigation regions according to the tributary stream upon which they depend.

TABLE IV

Irrigation Region	Area irrigated directly by rivers	Area irrigated by ponds—fed largely by rivers	Area irrigated by wells
1 Saho River.....	187.825 cho	4,177.920 cho	28.600 cho
2 Tonio "	83.862 "	2,739.361 "	64.391 "
3 Hase "	1,725.321 "	2,513.972 "	1.400 "
4 Tera "	1,191.142 "	839.372 "	14.350 "
5 Aska "	495.662 "	728.192 "	23.230 "
6 Soga "	844.092 "	1,193.261 "	130.312 "
7 Katsuragi River.....	1,075.792 "	1,323.160 "	46.561 "
8 Takuda "	171.542 "	1,295.090 "	34.700 "
9 Sami "	14.000 "	79.521 "	8.800 "
10 Katsuge "	107.281 "	1,605.572 "	43.450 "
Total	5,695.812 "	15,495.450 "	385.262 "

LAND UTILIZATION OF THE DIFFERENT NATURAL DIVISIONS

Table V indicates land utilization for the basin floor as a whole as well as for each of its natural divisions. Five kinds of natural landscapes are found. Each has its characteristic utilization.

TABLE V.—UTILIZATION*

AREA	Area in Square Miles	% of Area	% in Paddy Rice	Dry Crops	Ponds and Banks	Embankments	Rivers and Ditches	Shrines and Temples	Railroads and Tramways	Houses and Buildings	Forest, Waste, etc.
Total Basin Floor...	153.5	100	70.5	7.7	4.1	1.4	2.0	1.5	.3	5.4	6.4
Alluvial Plain above 50 meters..	99.1	64.6	83.3	2.2	4.5	1.8	2.0	1.04	.02	5.5	1.7
Alluvial Plain below 50 meters ..	23.8	15.5	81.3	5.1	4.8	2.1	1.2	1.6	.03	5.0	1.3
Old Alluvium under 50 meters..	2.4	1.5	70.7	21.0	.8	1.6	....	.8	....	6.0	1.0
Young Diluvium...	4.4	2.8	21.5	9.4	4.0	1.1	.1	1.5	.2	4.6	55.9
Old Diluvium.....	23.6	15.3	4.5	5.1	.08	.10	....	.11	....	.8	89.0

*Percentages are not exact in every case. They are derived from the planimeter readings of type area maps and from six or more Aza Censuses in each division. In some cases, a disparity between the two sources was found. It was rechecked on the ground.

The portion of the alluvial plain lying between the 50-meter contour and the diluvial terraces is the most favored land (Fig. 8). This area is above the worst flood zone and is relatively well drained. Lying nearer the sources of irrigation than does the area below the 50-meter contour, it is more effectively watered. The highest percentage of paddy land is found here. Similarly, being better drained than the lower part of the plain a larger part of the paddy can be employed for dry season crops. The writer has not been able to secure data in this regard except for the eight azas[6] of Hewa Mura. These azas lie in the marginal zone between the lower and upper portions of the alluvial plain. They may possibly more nearly represent an average for the entire plain than for the upper portion. However, they are certainly not better drained than the higher levels. These lands are used as follows: 8 cho in mulberry and orchard; 89.32 cho producing but one crop, other than mulberry or orchard (chiefly rice); 258.572 cho producing two or more crops a year. In other words, more than 72% of the land yields more than one crop. 36 cho

[6] Kaminitsu, Shimonitsuhashi, Idono, Minosho, Oe, Wakatsuki, Hiida, and Banshotanaka.

or about 10% yields three crops. This area then has an effective producing surface of 650.2 cho rather than the 355.9 cho of absolute arable land. In addition, every bank and dike is planted in at least one crop and the mulberry is so handled that it yields three or four crops of leaves a year. Even the areas of water are planted in carp and other fish. The irrigation ditches furnish edible small fish, mollusks, and wild plants. By any comparison with American agriculture the effective producing surface is double. In this fact, lies a large part of the answer to the great

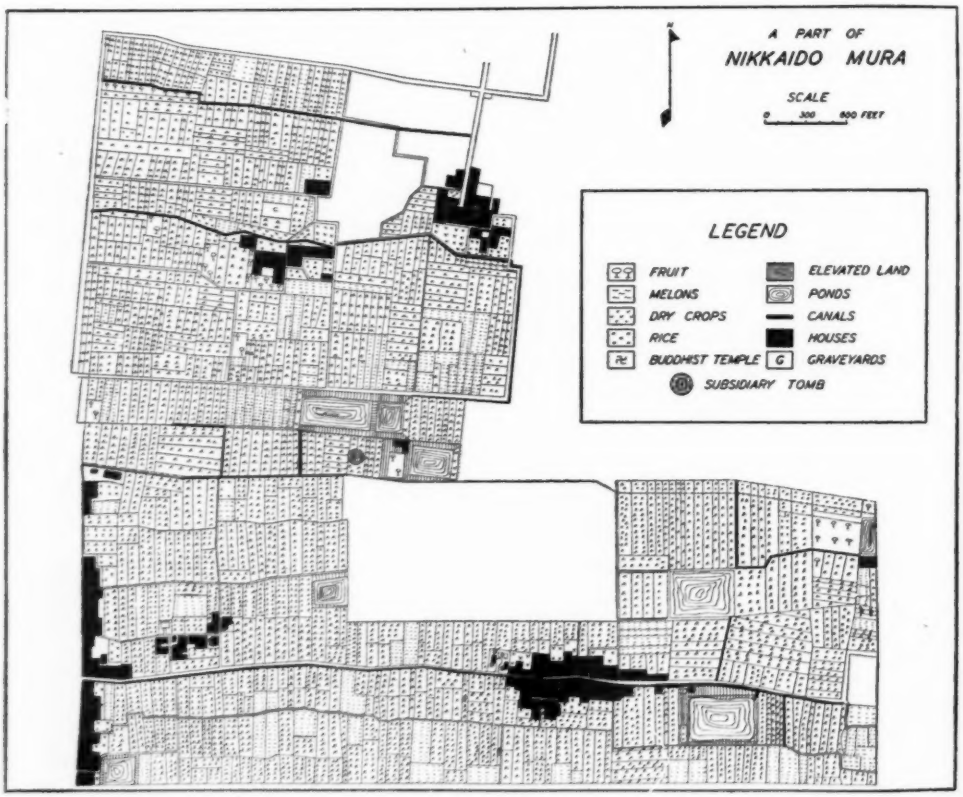


FIG. 8—Nikkaido Mura lies between the 50- and 100-meter contour lines on the alluvial plain. Note the rectangular form of the fields, ponds, and settlements. The orientation of roads, ditches, and embankments is distinctly on north-south and east-west lines in conformity with the ancient Handen. A large percentage of the land is used for paddy.

population densities encountered in the basin. About 70% of the dry crop production is "mugi," *i. e.* wheat and barley. The balance is largely rape seed and watermelons. Japan has no distinct agricultural regions, in an areal sense, such as are found in the United States, but rather it has them seasonally, as the above data indicate.

The alluvial plain below 50 meters has about the same agricultural systems except that a larger percentage cannot be drained and so produces but one crop. In this area, floods occur in the late summer and not infrequently do considerable damage to the rice crop. Scattered throughout this lower portion of the plain and most numerous and extensive near the rivers, are patches of alluvial terrace (Fig. 9). These remnants represent the old flood level of the lower Yamato River and its tributaries which has since then been lowered because of subsidence of the river mouth at Osaka Bay or because so much water is now taken from the upper river for irrigation or because of both. In any event, these bits of terrace form conspicuous features and have quite distinct utilization. They are rectangular in form and are greatly reduced in size, from what they would normally be, by the constant attack which man has made for centuries on their margins in order to secure more paddy land. Their borders present low vertical walls and the whole gives the appearance of low table lands. These areas are above the level of the ditches and consequently irrigation presents a serious problem. A large portion of the land is permanently in dry crops. The highest percentage of land is in house sites. This is largely marginal land and is utilized for this purpose for flood protection by the land owners of the lower alluvial plain. Irrigation water, however, is secured from wells. At the intersections of several plats of paddy the long arm of a Japanese pump rises into the air fifteen or twenty feet. Near the well is usually found a small storage tank. By painstaking labor and persistence enough water is drawn to the surface to keep the rice fields flooded. On the nearby Osaka Plain wells are used on similar lands, but are pumped by windmills. In the enclosed Yamato Plain this is not possible because the sea breezes are shut off by the Kongo and Ikoma mountains.

A great deal of fruit is grown on these lands, chiefly peaches and pears, for the Osaka market. The peach blossoms are particularly famous and attract many visitors in the spring. Watermelons are an important product in all parts of the Yamato Basin

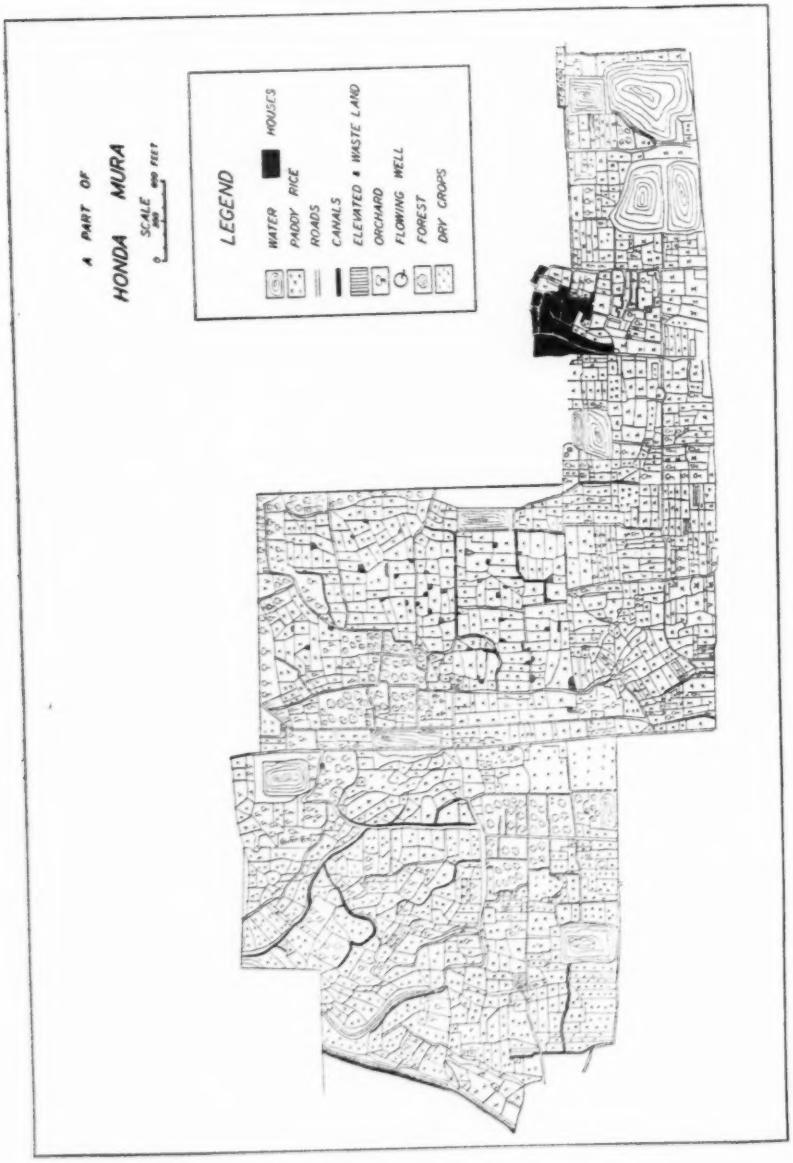

A PART OF
HONDA MURA
SCALE
LEGEND
WATER
PADDY RICE
ROADS
CANALS
ELEVATED & WASTE LAND
ORCHARD
FLOWING WELL
FOREST
DRY CROPS
HOUSES

FIG. 9—Most of Honda Mura lies below the 50-meter contour line in the area of alluvial terrace remnants. These terraces can be recognized by their cover of dry crops and orchards. Note the irregular form of the ponds and fields in conformity wit hthe distribution of terrace remnants. In the central and lower parts, there are small platforms in the corner of many paddies, due to the prevalence of floods. These are used for storing fertilizer in the growing season and for crops in the harvest time.

and are especially adapted to these terrace lands. This crop normally yields a value of over $1,000,000 for the Basin as a whole and in 1929 reached $1,583,726. It occupies about 1000 cho of land but is always produced as an interculture crop with soy beans and sweet or Japanese potatoes. In turn as each of these crops mature a vegetable is planted in its place. Consequently, as many as six products are secured from the land in the course of a year. In the other parts of Japan where watermelons constitute an important crop they are grown on sandy lands near the sea. In the Yamato Basin, however, good yields are secured on clay. The terrace lands range from silts to fine sand loams and so are better adapted than elsewhere in the basin. Temperature conditions are nearly ideal throughout the basin. 20° C is said to be ideal for the sprouting and early growth period and 25° C is ideal for ripening.[7] Middle April to early May temperatures in the Yamato Basin will average 19.6° C and those of July have a daily variation of 23°-28° C. Infinite care is taken in cultivation. The seeds may or may not be sprouted in a hot bed before they are put in hills. Each hill is faced southward and is topped with a thin layer of coarse sand and fertilizer. A straw shelter is built on the north edge of each hill for protection from the winds and to hold the heat of the sun. Constant weeding and watering takes place in the early growing period and later each melon is turned or sheltered in order to insure complete ripening and to retard decay. By this laborious method, however, the combination of crops from watermelon land sometimes values $300 per tan.

The young diluvial terraces occur in small patches along the borders of the northern half of the alluvial plain (Fig. 10). They constitute but 4.4% of the basin area. These lands are favorably located in regard to roads and are not of such inferior soils and surface conditions as are the older diluvial terraces (Plate 4).

[7] Yoshitaka Horiuchi, "Watermelon Production in the Nara Basin," *History and Geography* 3, No. 7, 38-42. (In Japanese.)

Mulberry, vegetables, tea, and persimmon orchards constitute important land uses. A little paddy rice is produced as well. A relatively high proportion of the area is occupied by buildings as the main roads traverse them and many farmers of the alluvial lands have their homes on the borders.

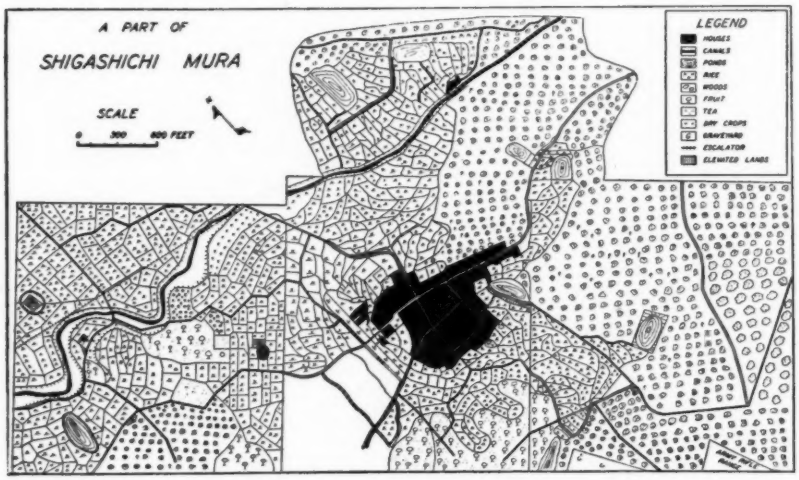


FIG. 10.—Shigashichi Mura is on the eastern margin of the basin and includes part of the steepy inclined alluvial plain as well as both Young and Old Diluvial terraces. Rice is found on the alluvium of the plain and the valley bottoms. The dikes and the form of the paddies correspond to the contour lines. Tea, orchards, vegetable gardens, and settlements occupy the lower parts of the Young Diluvial terrace, while forest land accounts for most of the upper Young Diluvial and Old Diluvial terraces.

The old diluvial terraces in general constitute areas of poor soil and surface conditions. Coarse sands and gravels lie interbedded with thin layers of blue and yellow clay. Erosion has reduced considerable areas to "bad lands." Transportation facilities are not developed except on the lower margins. In consequence, these lands are largely given over to forest and waste. The valley bottoms account for all of the rice production and the dry crop acreage is largely confined to the lower adjacent slopes. A few tea gardens, persimmon orchards, and vegetable gardens are found on top of the terrace but with few exceptions these are near the edge of the alluvial plain. The making of charcoal and the cutting of wood constitute important industries.

HIETA AZA, A REPRESENTATIVE VILLAGE

Hieta Aza is rather a typical agricultural village. It is located near the middle of the alluvial plain and has a population of 380 people. Its paddy area is 58.4604 cho and dry crops occupy 4.0409 cho. Mulberry and pear orchards account for 2.8 cho of the dry land. Of the paddy area, 45.6 cho also produces a winter dry crop, 70% of which is "mugi" and most of the balance is rape seed. There are seventy families in the village. Twelve of these bear the name of Matsumura, 10 Ueda, and 7 Imai. There are 27 other names with but one, two, or three families bearing them. This, however, does not disprove the theory that these ancient villages are "broken down derivatives from original endogamous units which consisted normally of two families (or clans) which were themselves exogamous."[8] Within historical times, several ambitious sons of the main families have established new family names, as for example, the present Hashimoto group which followed the well establishd practice of taking their name from the location of their house at "the foot of the bridge." There is no record of any outsider having settled in Hieta and probably all but the three main names have had similar origins. It is even possible that the Imai (meaning north in the terminology of the ancient 12 directions) was of this origin. Of the 70 Hieta families, two are tenants, 40 are part tenant and part land owners, 10 are large land owners and rent their surplus acreage, and the balance have just enough land for their needs. One family maintains a liquor shop and another has a small general store and sells chiefly cakes, soap, and tobacco. Both families depend upon the soil for most of their support and the stores occupy but a corner of one room in their otherwise ordinary farmhouse. There is one priest and the temple owns 1½ tan of paddy which is worked by a tenant family. The income from this land above the tenant portion accrues to the priest, and is supplemented by gifts of food from the villagers and by money paid at times of festivals, funerals, etc. There are no artisans in the village and no industries, if we except one small goldfish pond.

Hieta differs historically from many villages in that it was under temple control rather than a feudal lord during the period of the Shogunate. As a result it was less heavily taxed and the

[8] Hall, R. B.: "Some Rural Settlement Forms in Japan," *Geog. Rev.* 21, 1931, 100.

land was apportioned according to the number of people in each family. With the Restoration the principle of private property was established, and in a few years, more than one-third of the rice land had passed into the hands of more experienced people from adjacent villages.

In later years, however, the more aggressive Hieta families have purchased the bulk of this land back and several have become landlords of considerable importance. At present, but five cho are owned outside of the village.

INDUSTRIES OTHER THAN AGRICULTURE

Aside from the agricultural industries, pilgrims bring the largest amount of wealth to the Yamato Basin. These people flock into the basin by the millions in the spring and fall months to visit the temples and shrines, the imperial tombs and other antiquities and sacred grounds, and to enjoy the seasonal flowers and foliage for which the area is justly famous. The expenditures of the average individual are small but the total must be very large. Estimates of the annual total of such expenditures vary between 15 and 30 million yen.

Nara City, alone, has 123 inns (many of which are extremely large), 140 geisha houses, 143 restaurants, 54 souvenir shops, and countless street stalls, all of which cater almost exclusively to tourists. Nara City and vicinity is also rapidly becoming a pleasure resort for the people of industrial Osaka. Several fine summer villas are now located on the old diluvial terrace overlooking the temple grounds and the city. A more detailed account of these pilgrimages will be found elsewhere in this paper.

Products which bear the flavor of antiquity and religion are made on a small scale, chiefly by home industry, and marketed wherever Japanese people are found. Of these industries, Yamato drugs are by far the most important. In fact the value of drugs produced vies with the rice crop. The annual production is about 22¼ million yen and 10,800 people travel at least part-time in all parts of Japan peddling these drugs from door to door. These people are even found in Chosen, Taiwan, China, the Philippines, and Polynesian Islands peddling among their countrymen and attempting to enlarge the market among the native populations.[9] Over 400 houses participate in the manufacture. The Yamato

[9] Osaka Asahi, April 17, 1929; and *Statistics of Industry and Commerce in Nara Ken*, Nara, 1929.

drug industry, however, belongs to a past age and the growing influence of modern scientific medicine is already threatening it.

Japanese ink (sumi) and brushes are famous products of the city of Nara. Their combined annual value is about half a million yen. Both ink and brushes were introduced centuries ago from China and the first Japanese production of them was at Nara. The ink is made from the soot of burning pine and the raw material is secured from the mountain lands to the south. The brushes are made of imported bristles from Chosen, the handles being made from the Princess bamboo of Hakone or reeds from the Osaka Plain. About 40 establishments make ink in Nara City and suburbs and 130 houses make brushes. In this industry, Nara has a national monopoly but the western pen is causing a marked decline in the market.

The making of chop sticks is an important industry of several towns on the border of the basin. Shimoichi and vicinity are particularly significant. About 80 establishments produce nearly one million yen per annum of this article. The chop sticks of Yamato are of cryptomeria and the cheaper imported soft-woods now used in other parts of Japan are threatening the industry.

Two kinds of lacquer are produced in the Basin. The vicinity of Yoshino makes a cheap lacquer for furniture and utensils while Nara City produces the famous Nara lacquers which are used chiefly in art works. The designs are of historical and religious character and the products have a secure market. Nara City has about 100 establishments making lacquer and lacquer products which have an annual value of about 400,000 yen.

Shimoda and Toma villages, at the foot of Nijo San, owe their industrial significance to the occurrence of "Kongo" or ruby dust in local deposits. This product is found nowhere else in Japan and, in fact, is rare as a world product. Six small establishments produce about a quarter million yen per annum. The market is world-wide, the dust being used for polishing metals, glass, and jewels.

A newer industry is the manufacture of buttons from shell imported from the Japanese Pacific Islands. 60% of Japan's total production is in the Basin, where 187 establishments in almost as many villages produce over one million yen per year. Competition of Osaka and Kobe producers is becoming serious.

A variety of food products is made, chief of which are sake, Nara pickles, soy sauce, Yamato bean cake (frozen tofu), and

dried noodles. These industries are widespread, but the largest number of establishments is found in Nara City and the towns along the main roads and inter-urban lines. Over 1,000 houses engage at least part-time in these industries and nearly nine million yen is earned annually.

The manufacture of cotton cloth is centuries old in the Yamato Basin but the modern industry is a product of the past quarter century. It is still primarily a household industry but imported cotton and power looms have displaced the local raw material and the primitive equipment. A blue and white spotted cloth, called Yamato kasuri, makes the traditional garb of students throughout the Empire. About 350 houses, many of which are in Nara City, produce cotton cloth to the value of 13 million yen.

The making of cotton yarn is a new and large scale industry. One factory at Koriyama and one at Takata, produce in excess of 10 million yen of yarn in normal years.

Hemp cloth and mosquito netting are also important manufactures, each produced in about 40 small establishments. Girls furnish almost all the labor for these industries and except for one large mosquito net factory in the suburbs of Nara the products are chiefly made by hand labor.

The rearing of goldfish is an important industry at Koriyama, where the ancient castle moats are put to this use. The largest establishment, however, is on the site of the old castle where the grandson of the last feudal lord has followed the family hobby of long standing and has thereby amassed a fortune. Several new varieties have been developed here and a worldwide market has been developed.

Except for the two cotton yarn and the one mosquito net factories, the manufacturing industries of the Yamato Basin are hardly beyond the household stage. Most of the people employed are part-time farmers or the children of farmers. The area has no advantages in industry except tradition and relatively cheap labor.

DENSITY AND DISTRIBUTION OF POPULATION (Fig. 11)

The population of the Yamato Basin, as a whole, is approximately 300,000. As previously indicated, it is essentially a rural population. There is one city, Nara, which has 52,000 people. There are ten sizable towns which average 3,800. The total number of other agglomerations, large and small, is about 800.

From the many samples taken, these seem to average 260 people. In addition, there are between 200 and 300 isolated houses averaging five and a fraction inmates.

The average density for the basin floor, excluding all of the older diluvium except the Mami Hills, is 2,440 per square mile. The alluvial plain has a density of 1,873 actually residing upon it. However, this is not a fair estimate of its ability to support population, as great densities occur just above its margins. For example, the density on the alluvial terraces is 2,015 and the Mami Hills have a density of 1,522. In both cases a considerable portion of the population farms alluvial land, but resides above it. A half-mile wide strip of land, encircling the basin floor and including the extreme upper alluvial plain and the young diluvial terraces has an area of 60 miles, a total population of 182,640, and a density per square mile of 3,044. This zone includes the city of Nara and most of the larger agglomerations. The ancient main roads lie within it as does most of the electric railway mileage. A similar strip following all railways shows a density of 3,074. These densities obviously are very great and when recognition is made of the nearly pure agricultural economy,

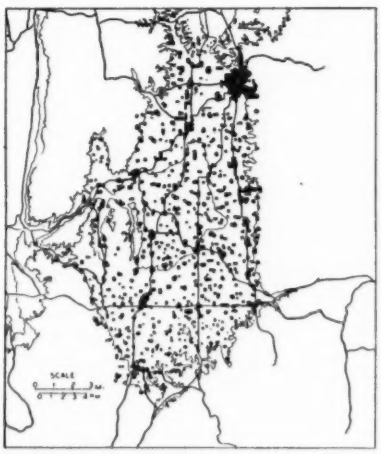


FIG. 11—The Major Village Agglomerations, Towns, and Cities of Yamato.

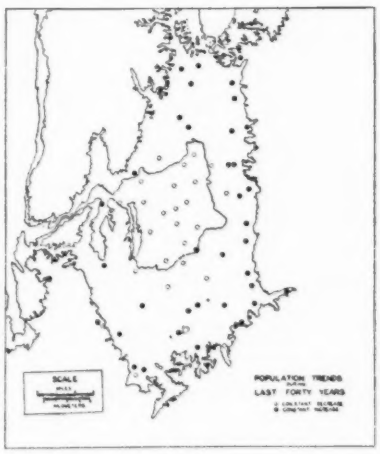


FIG. 12—Increases and Decreases in Population in Yamato.

they are even more surprising and may well be compared to the world's greatest densities.[10]

SETTLEMENT

The Yamato Basin is the cradle of Japanese civilization. It was here that the great warrior, Jimmo Tennu, first emperor of Japan, led his Yamato tribesmen at about the dawn of the Christian era and established the Japanese state. It was here that Chinese, Korean, and Indian cultural influences were brought and amalgamated with the already mixed culture of the Yamato people. Archaeology has shown that at a much earlier date the basin supported a considerable population of Ainu and proto-Yamato people. This area then has had a continuous settlement for untold centuries. Each cultural change in Japanese life is reflected in the cultural landscape of the Yamato Basin. Unlike the Osaka and Kwanto plains there has been no marked economic rejuvenation. Continuity with the past remains largely unbroken. Further there has been an exceedingly dense population for many centures and a great pressure upon the land. Consequently there are few places in the world where man has so completely modified the natural landscape.

In a previous paper,[11] the writer has described the most obvious and what might be termed the basic settlement pattern of the Yamato Basin. A brief survey, then, of the "Handen" will suffice before describing the more detailed and complex developments of settlement.

Where a very flat land surface occurs, the distribution of cultural landscape forms thereupon may be rather artificial and the control of surface may be almost negligible. In Yamato, and in fact on all of the alluvial plains of Kinki, we find areas of grouped habitat, assembled in compact masses in villages like colonies of social plants, which are separated by wide extents of open field. Each village, in the middle of its fields and behind its moat and hedges, forms thus a small enclosed world—seemingly sufficient unto itself. It is a "Haufendorf" settlement of rectanguar form accompanied by a regular road and water-work pattern. This is the "Handen" which was introduced from China prior to or during the seventh

[10] Interesting observations on the distribution of population in the Yamato Basin are to be found in Ishii, I.: "The Distribution of Population in the Nara Basin," *Chiri-Kyozai-Kenkyu,* 1-18, Pub. by the Nara Higher Normal School, Tokyo, 1924; and in Nishida, Y.: "Siedelung in The Nara Basin," *Chikyu-The Globe,* 4, No. 4, 348-359. (Both in Japanese.)

[11] Hall, R. B., *op. cit.,* 94-102.

century of our era. This involved a partition and repartition of the land into squares, all dividing lines were oriented north-south and east-west and were adjusted to the four great roads leading from the Nara or Heijo capital. The land divisions and systems of numbering, although on a smaller scale, was almost identical to our present range and township system in the United States. Based upon the assumption that a plat of paddy land six feet by six feet would feed an adult male for one day and a fraction of this amount other members, the land was apportioned among families in multiples of the lunar calendar. Village sites were established, each involving about thirty houses, and evenly distributed in conformance with the system of land division. They form a checkerboard pattern and lie at an average distance of one kilometer from each other. Each agglomeration was surrounded by a moat, a wall, and a hedge, and so compact was the settlement that it appears as a detached bit of an urban landscape.

However, the "Handen" was a utopian system and, although more completely applied in Japan than in China, could not be entirely perfected. Pre-Handen settlements could not be completely destroyed. The water-work net although largely modified to fit the new system was nevertheless controlled by delicate inclinations of the land surface. The road system tended to coincide with the water nets and so the site and forms of settlement were influenced by them.

Expediency wrought a gradual change in the settlement pattern in the centuries following the establishment of the "Handen" in spite of the fact that the law was designed to maintain it in entirety. The surprising fact is that an artificial arrangement of settlement could so long violate natural law. For example, the portion of the basin lying below the 50-meter contour line is unhealthful and is subject to violent floods during the typhoon period of the late summer and fall. It was not until the last half century, when the laws concerning the migration of people from their native villages had been modified, that there has been any shift in population density. At present, virtually all villages lying below the 50-meter contour line are slowly decreasing in size while villages above the flood level are for the most part showing substantial growth (Fig. 12). This shifting of population from the center of the plain toward the margins shows clearly that the influence of the natural environment is a persistent, ever present influence, which it is true may be retarded for centuries by man-

made law or other artificial force but which will eventually assert itself and in a broad way, at least, man will adjust himself to it.

Facts in settlement geography that require description are infinite in number, but the stock of terminology to express them lucidly is exceedingly meager. Similarly, methodology is far from being adequately developed. I would like to suggest that in studies in culture morphology, it may be possible to borrow both the method and terminology that has been developed in geomorphology. If we regard the fundament in the same light as the geomorphologist regards the initial surface or "urformen" and just as the initial uplifted and tilted land surface is subject to changes by erosion so each culture wave or rejuvenation causes a new culture landscape to come into being. As rivers excave valleys, so road systems will be generated by the development of a commercial culture and as the rock surface receives weathering so the land will be reclaimed and settled.

Where too intense and sudden a change takes place, remnants of the former culture landscape, comparable to peneplain remnants, will remain. With a sudden change, there will be a great intermingling of culture landscapes, old and new, as are found in glacial areas which now lie in middle latitude lands.

Many such similarities can be exemplified in the settlement morphology of the Yamato Basin.

A detailed study of village forms hidden though they are in the "Handen" pattern brings to light remnants of each important culture wave.

The Yamato Basin seems to have proved an attractive abode throughout human history. This is shown by the antiquity and great density of Ainu and other pre-historic sites (Fig. 13). These were located, in practically all cases on elevations adjacent to but above the alluvial land. The most common location was on the outer margin of the diluvial terraces. Others are found on minor elevations scattered over the plain. These people were hunters and dry farmers. Their cruising range was small. Thus, they express the edge-effect by settling where the different environments necessary for their existence lay near at hand. Above were forest lands for hunting, below were the agricultural fields and the spring horizon. These sites were above the flood level and still not far from the rivers of the plain where fishing was carried on.

The early Yamato and proto-Yamato had much the same cul-

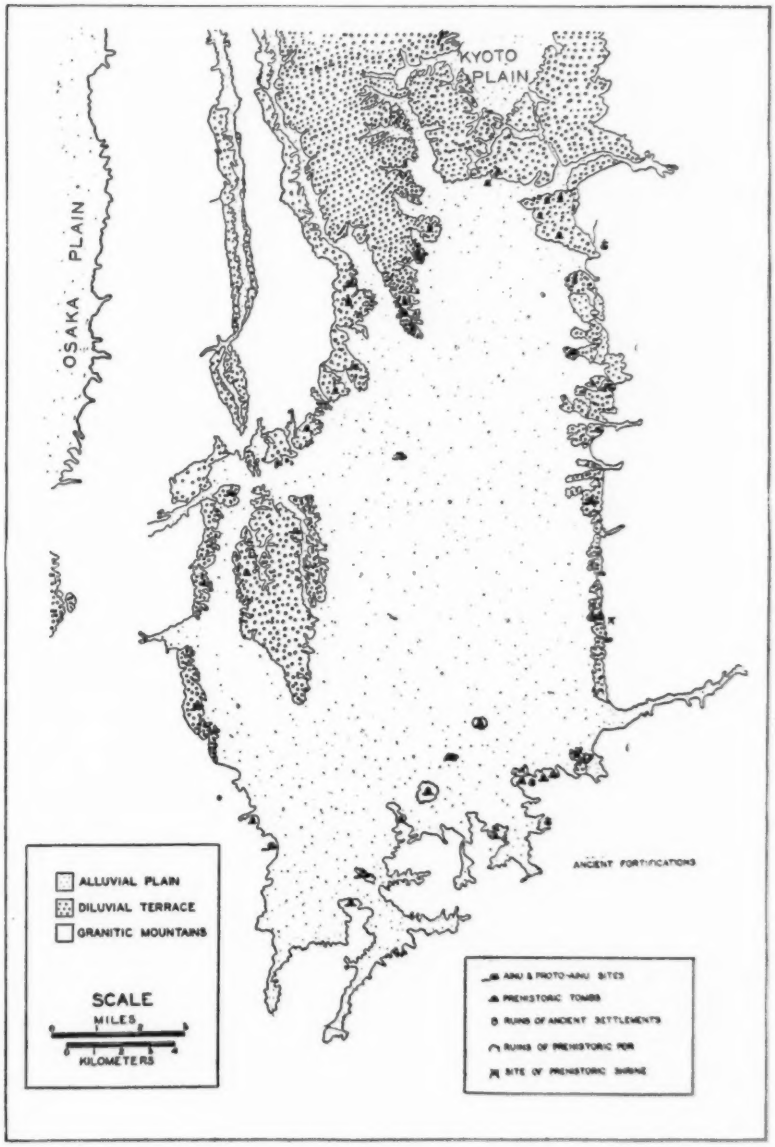


FIG. 13—Ancient Sites of Human Habitation in Yamato.

ture and occupied the same sites. Soon, however, Chinese influences were felt and the capital towns were modeled after the Chinese form. Four great gates, corresponding to the cardinal points of the compass, were the terminals of roads leading into the basin. Thus the outlines of a rectangular road system were established long before the introduction of the Handen. The main roads, then as now, ran along the margins of the plain and connected and caused the growth of earlier settlement. These main roads, too, lay above the flood level and in the zone of mixed environments. At first, each emperor built a new capital city and as the Yamato occupied the southern part of the basin first the early road systems were built there. The establishment of the Nara or Heijo capital on the northern margin of the basin in the seventh century marks the first permanent capital. It was here that Chinese culture entered in full force. The Handen was established, the "kaito" or moated village was introduced and the habitation was modeled in the enclosed Chinese fashion. Buddhism became the religion of the land and temple towns grew rapidly. In the ninth century the capital was moved to Kyoto. Soon the imperial power declined. The priesthood gained control. The temple towns were fortified, and became havens of refuge for the common folk. They grew rapidly. The present city of Nara grew up about the suburban temples of the old capital. Seidai-ji is an example of a smaller center which reflected this social change.

The power of the church was broken with the rise of the feudal lords. Imai, a fortified temple town, became again an agricultural village. Castle towns became the focal centers. In some cases, as in Tawaramoto, the temple towns became castle towns. Usually, however, new fortifications were built at highly strategic points commanding passes through the mountains or commanding the main roads. Koriyama, Shinjo, and Koizumi are such examples. The old moats and fortifications are still to be seen as are the towns which grew up in their shadow where protection and trade could be found. A period of peace came with the Shogunate and the iron-clad regulations of feudalism were established. Towns were controlled and limited in their functions. Some castles were destroyed, as in the case of Shinjo, and their towns declined. Others were strengthened and their towns grew. Such was the lot of Koriyama. On the main roads, "shukubamachis" or post towns were designated at regular intervals. Inns, stables, and

police posts were established in the center of these selected towns to aid and control transport and communication. Trade was naturally drawn to these points and markets grew up on their edges. Thus there were many villages which grew into sizable towns during this period, especially if they commanded a pass through one of the adjacent mountain lands. Such were Ichinomoto and Sakurai. Villages which were the sites of famous temples or shrines became points of pilgrimage. These are the "monzen machis," many of which have grown rapidly in recent years with improved facilities for travel. Nara City is an excellent example.

The coming of western civilization brought profound and sudden changes in the settlement morphology of many parts of Japan. In the Yamato Basin the changes, though significant, have been slow. Isolation and the lack of resources other than agricultural. have not encouraged any large development of manufacturing or commerce. However, alterations in the settlement pattern gradually have taken place and are continuing. The most significant changes grow out of new methods of transportation. Both steam and electric railway lines have been built and have greatly stimulated village growth adjacent to them. Likewise, they have either not affected or have actually caused decline in areas too distant to be served by them.

In some cases, the railways follow the approximate trajectory of the old main roads. In others, they depart from it. Many combinations are found. At Koriyama, the railroad and the ancient Shimokaido or lower road meet and Koriyama has grown. At Nagana the old and the new roads pass at about a half kilometer from each other and a new village of Nagana is growing up about the railway station. An embryonic "strassendorf" now connects the two.

In these changes in the settlement pattern, we find, first, that between the lines of greatest transformation there will remain relict forms of the earlier cycle. As in the case of a peneplain. remnants will be preserved longest at the greatest distance from the major streams, so culture forms will remain the longest unchanged in areas most distant from the new major lines of transport and communication. Similarly, roads like rivers may appear at different places in different cycles and thus cause local changes in form and structure.

Some modern industry has entered the basin. The southward extension of Nara City is due to the introduction of cotton spin-

ning. A half-dozen settlements have grown from villages to towns because of the establishment of small factories in them.

Next to agriculture, the most important industry of the Yamato Basin is the serving of religious pilgrims and tourists. The improved facilities of transport which have come with western civilization have greatly stimulated this. Nara City owes most of its growth of the last quarter century to this function. Tambaichi, a market village, in feudal days, has now a population of 3,000 almost entirely because it is the headquarters of the Shin den sect (Plate 5). O mura has prospered because of the thousands of people who come each spring to see its famous peach blossoms or who headquarter there in the mellow days of fall to enjoy the chrysanthemums and the autumn colorings of the maples on the nearby mountain slopes.

The map of village types (Fig. 14) presents certain features which are more individual than general. Shirado is a simple kaito which has not been greatly affected by later influences. Hieta is a modified kaito and has beyond its moat two overflow settlements or "dekaitos" (*i. e.* settlements "outside of inside the walls"). Tainsho is made up of several kaitos which are attached to one another

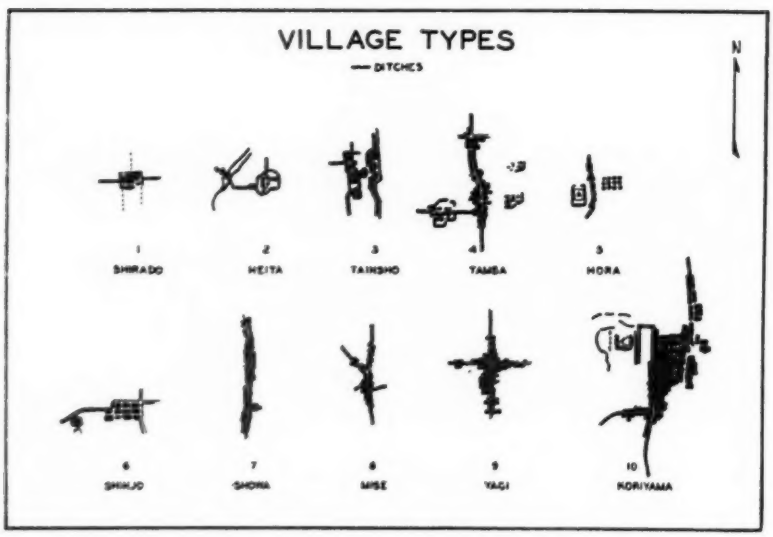


FIG. 14—Ten Village Types Found in Yamato.

and bear such names as North, Middle, and South Kaito. Tamba includes at least three kaitos which are losing in competition with the new settlement along the main road. Hora is an "eta" (outcast) village which was recently moved from the foot of the nearby imperial tomb, by the government. Its rectangular pattern is due to modern planning. Shinjo was established in the period of the Shogunate and owes its rectangular pattern to an enlightened feudal lord. Showa is a fine example of a "strassendorf." Mise is a Y-shaped village of "strassendorf" character lying at the intersection of two main roads. Yagi is a somewhat similar town and has the form of a "red cross" due to its location at the right angle crossing of two main roads. Koriyama, the greatest of the castle towns, owes much of its form to the trajectory of the great Shimo kaido in passing the hill of the castle.

Horan Village (Fig. 15, Plate 6) recently incorporated as a northern suburb of Nara City, but still an agricultural village, is unique among the villages of the Yamato Basin. It is a "strassendorf" with the long, narrow fields leading directly from the rear of the house. The portion of the field nearest the house is used for dry crops while more distant parts are in paddy. The street

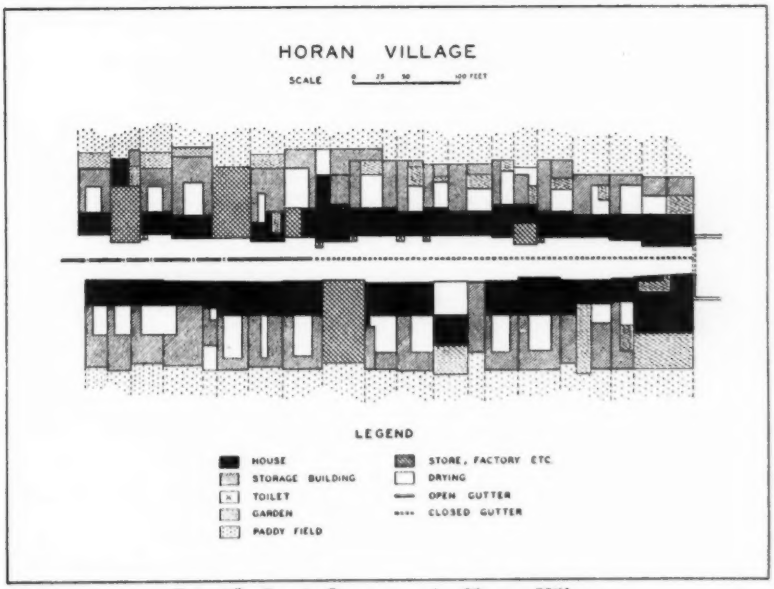


FIG. 15—Land Occupance in Horan Village

originally had an open sewer in the middle but this is being covered. Each house had a public toilet in the street but a municipal law forbids their existence after 1934, so they are rapidly disappearing. The street is also the drying yard and storage place for tools. The house is an inclosed unit much like the Yamato type,[12] but differs in detail, especially in the clay pigeon mounts on the terminals of the ridge pole.

These few examples do not exhaust the many individual village characteristics which are found in the basin. In fact, there are as many forms as there are villages and each one warrants special investigation.

NARA CITY

The metropolis of the basin and the capital of the province is Nara City. It contains a population of 52,000 and is the most famous point of pilgrimage in all Japan. Nara is an ancient city which has not been greatly altered during the modern period. A study of its morphological development and its present structure brings to light not only the main features of pre-Restoration Japanese urban development but also tells much of the character of oriental cities.

The original Nara was founded as the imperial capital in the seventh century. It grew up suddenly about the imperial palace, the remains of which can still be found about two kilometers west of the present city. It was built in strict conformity with the Handen. Buddhism was then at its zenith and great temples were built on the eastern and western outskirts of the city.

In the ninth century, when the Nara capital was abandoned for Kyoto, the city disappeared and the land reverted to agriculture. The temples, however, gained power during the following century and became refuges for the common people. The new Nara grew up about the three great temples of the western suburb. During the long feudal period, it gained considerable commercial significance as it commanded the passes through the Narasaki Hills to Kyoto and the chief valley routes into the Kasagi Plateau. With the coming of the railroads, its temples and antiquities, its famous cherry blossoms and maples have attracted increasing numbers of

[12]Hall, R. B., *op. cit.*, 101-102 and Figs. 7-8.

pilgrims and tourists each year. In 1930, 3,000,000 people visited Nara City from all parts of Japan and in fact the world. This has become its primary industry and consequently has encouraged th persistence of the ancient urban landscape.

A functional map of Nara City shows (Fig. 16) first of all a surprising lack of conformance with the concentric circular zoning of western cities. The great and ancient roads are the primary lines of attraction for commercial establishments even beyond the city's limits. No definite zoning of other functions can be found. A vertical cross section through the center of the town shows a flat vertical profile unlike western cities. Similarly there are no differences from place to place in the materials or design of structures (Profiles A and B). An occasional exception is found in recent and exotic western buildings such as banks or public offices.

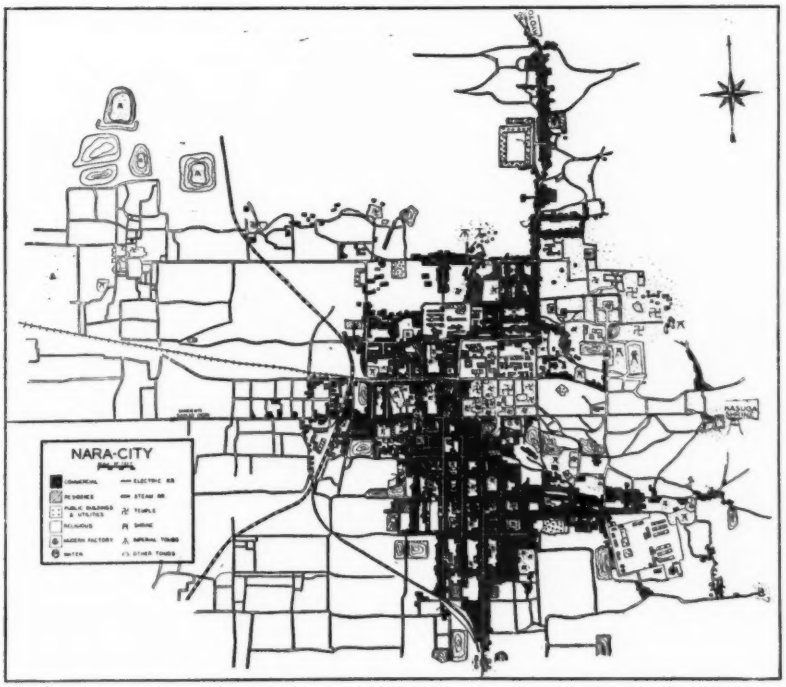


FIG. 16—Functional Occupance in Nara City

An analysis of a downtown block shows many interesting contrasts (Fig. 17). The occurrence of blind alleys and sub-streets and the varied land uses are the most significant.

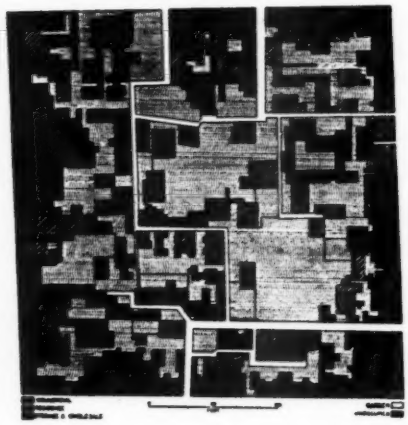


FIG. 17—A Representative City block. This block is centrally localted in Matsue, an ancient and unaltered city and a provincial capital. It differs in detail from a block in Nara, because it was a castle town; hence streets and alleys are more zigzag, for defense. The interior of many a Nara block contains a shrine or small temple, as Nara was a temple town.

A not uncommon economic and morphologic unit is here shown where residence, retail, wholesale, and factory are included under one roof and accompanied by a small farm (Fig. 18). This establishment occurs in the main downtown blocks of present Nara and doubtlessly approximates the average of ancient Japanese cities. It is still commonplace in such cities as Nara and Matsue which have not felt strongly the changes of the past half century. In this particular unit, the front room is used by the father and eldest son for the manufacture of tatami or floor mats. The second room is used by the wife and daughters to retail the mats. Behind, is the residence and a storage house where an enterprising younger son wholesales reeds to other mat makers. Still farther in the rear is the family garden and orchard. Many such gardens contain a small plat of paddy rice. This family estimated that nearly a third of its income was derived from agriculture.

This brief survey of settlement in the Yamato Basin perhaps exemplifies the statement of Professor Demangeon that the study of settlement "opens up a vast domain where the geographic explanation must pass over a complexity of facts—some pertaining to distant human history and others arising under our very eyes.

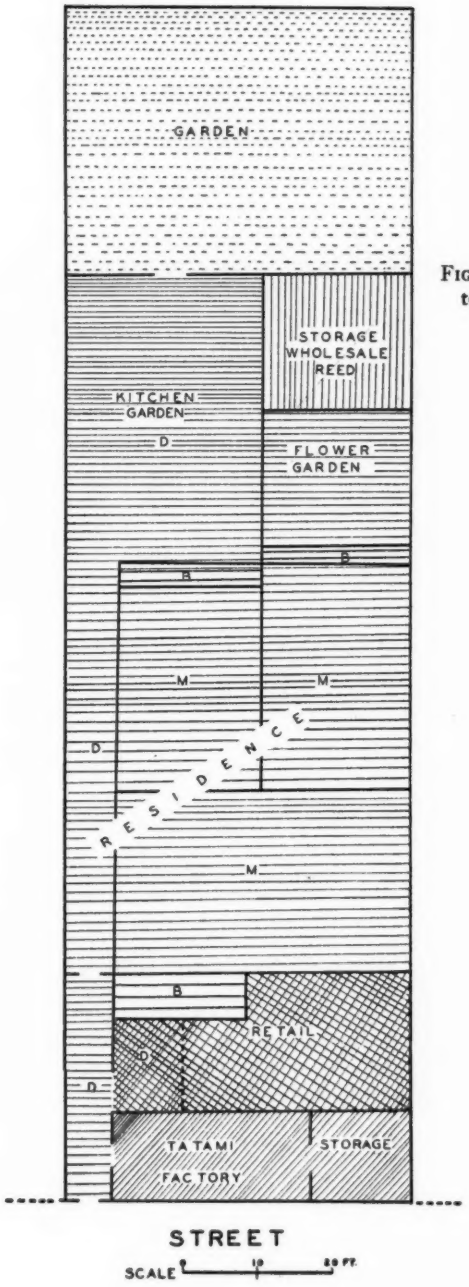


FIG. 18—A small farm in downtown Nara City.

It calls our attention to a variety of studies; natural conditions, social conditions, demographic conditions, economic conditions. It includes the knowledge of human settlements throughout history. It constitutes one of the most original of the human sciences, because it is a question of knowing how the bonds which connect the life of men with the soil are fastened.[13]

[13]Demangeon, A: "La Géographie de l'Habitat Rural," *Ann. de Géog.* 36 (1927), 1.

PLATE 1—The Kongo Mountains from the center of the Yamato Basin. Nijo-san is shown at the extreme right.

PLATE 2—Fields of rape flowers in April.

PLATE 3—Wheat on paddy land, early April.

PLATE 4—Dry crop land on Young Diluvial Terrace.

PLATE 5—The New Section of Tambaichi, with its Shrine in the center.

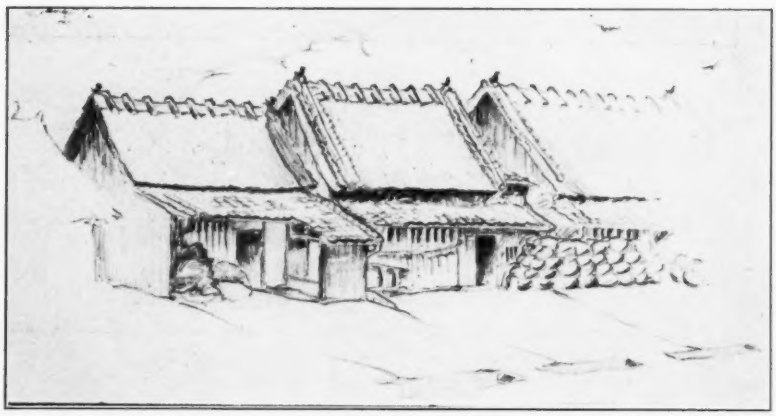
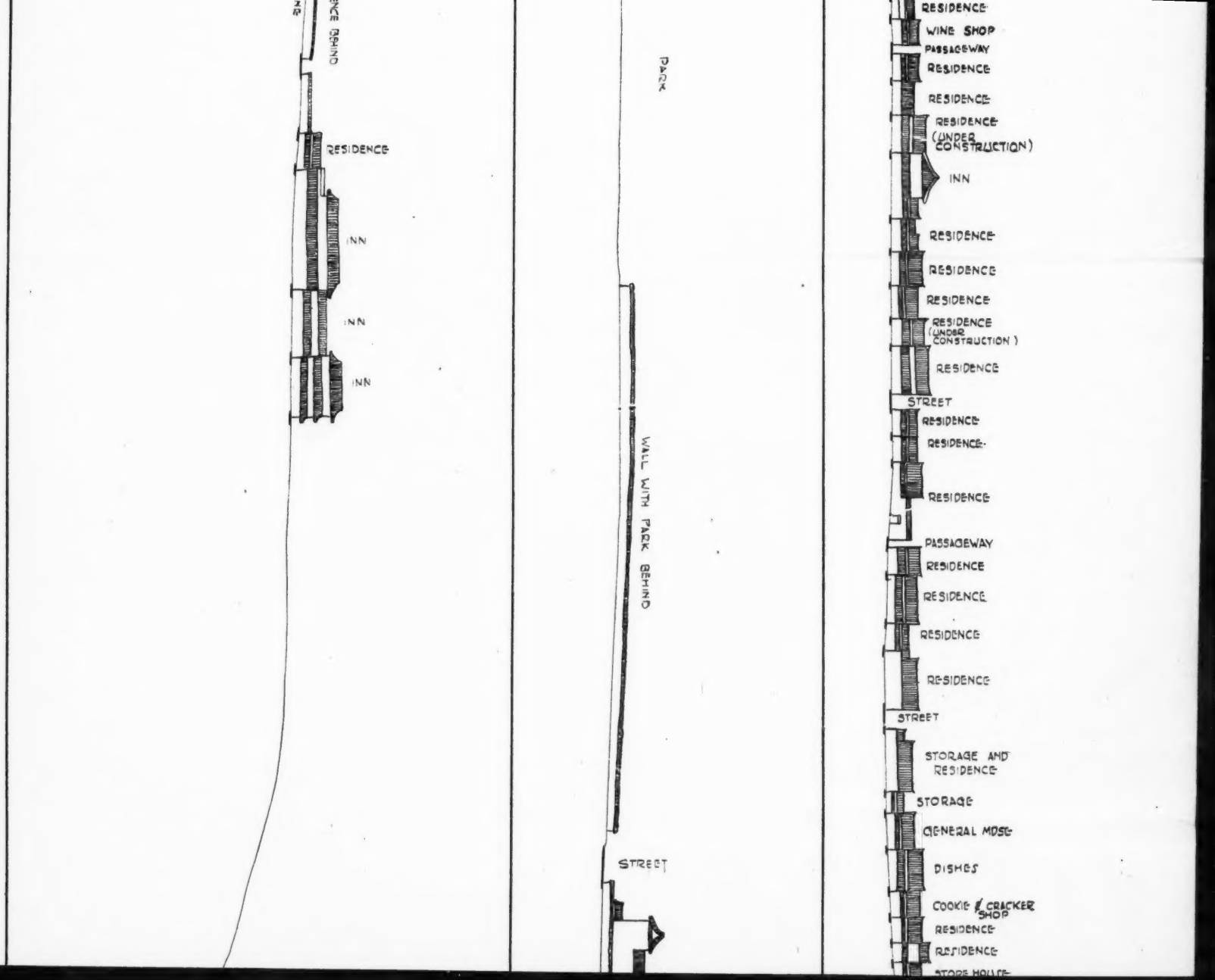


PLATE 6—Street in Horan Village

STREET
FUEL
FUEL
RESIDENCE
RESIDENCE
HAMMOCK MAKERS
BRUSH MAKERS
FURNITURE
CARPENTER
GROCERY
RESIDENCE
RESIDENCE
WINE SHOP
PASSAGEWAY
RESIDENCE

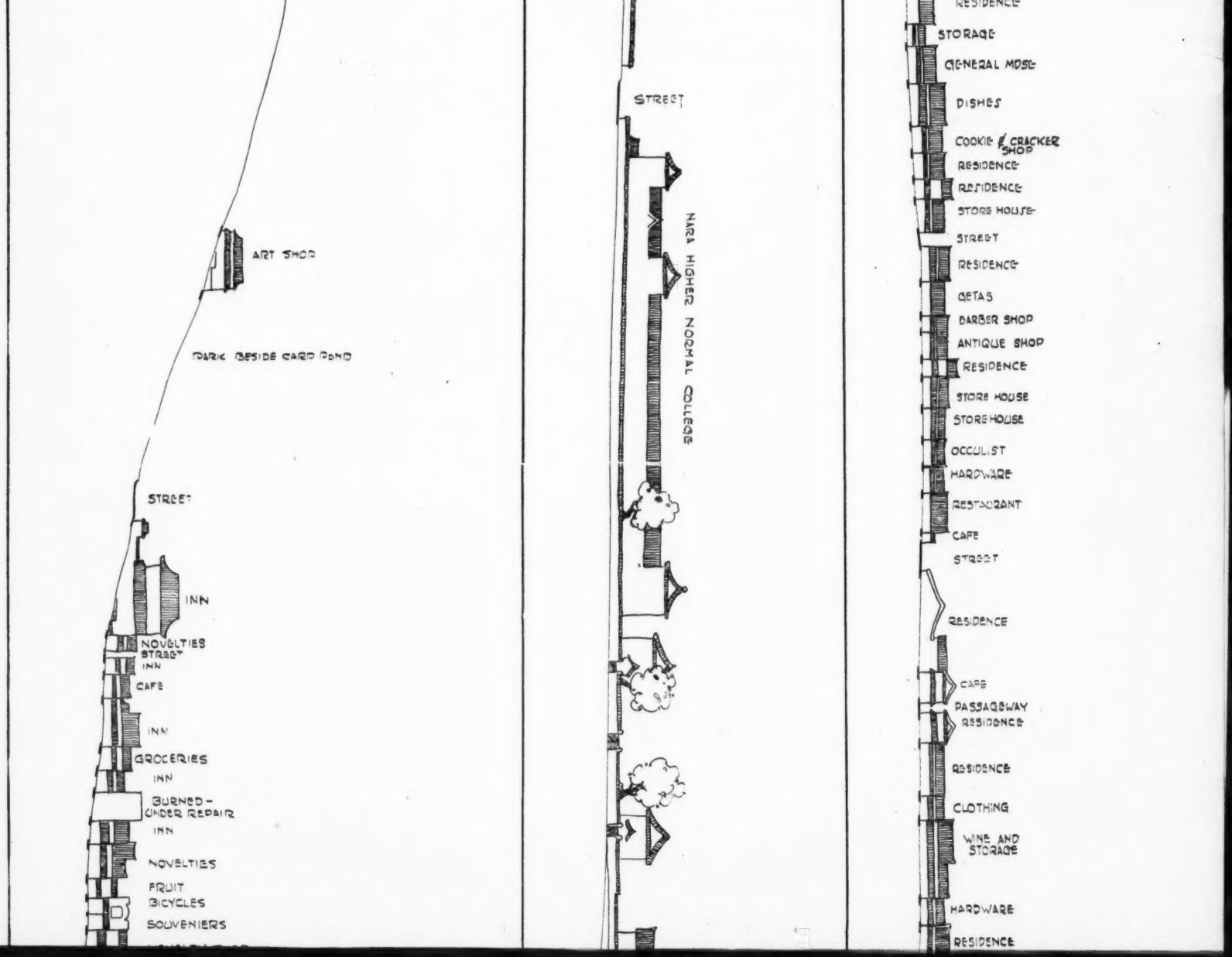
STREET (SAN JO DORI)
WALL WITH PARK BEHIND
STREET
PAR

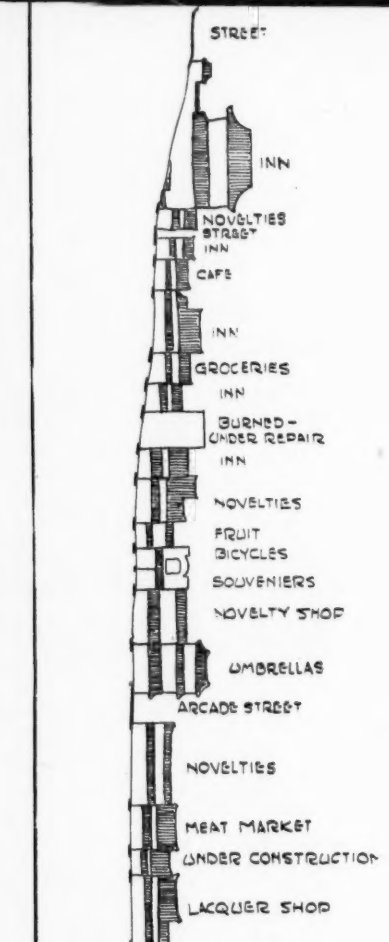
LARGE INN
STREET
WALL WITH RESIDENCE BEHIND
ON THROUGH THE PARK TO KASUGA SHRINE

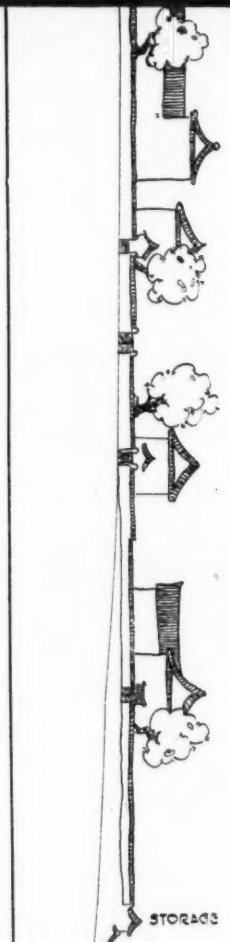

RESIDENCE BEHIND
RESIDENCE
INN
INN
INN
PARK
WALL WITH PARK BEHIND
STREET
RESIDENCE
WINE SHOP
PASSAGEWAY
RESIDENCE
RESIDENCE
RESIDENCE
RESIDENCE (UNDER CONSTRUCTION)
INN
RESIDENCE
RESIDENCE
RESIDENCE
RESIDENCE (UNDER CONSTRUCTION)
RESIDENCE
STREET
RESIDENCE
RESIDENCE
RESIDENCE
PASSAGEWAY
RESIDENCE
RESIDENCE
RESIDENCE
RESIDENCE
STREET
STORAGE AND RESIDENCE
STORAGE
GENERAL MDSE
DISHES
COOKIE & CRACKER SHOP
RESIDENCE
RESIDENCE

RESIDENCE (UNDER CONSTRUCTION)
RESIDENCE
STREET
RESIDENCE
RESIDENCE
RESIDENCE
PASSAGEWAY
RESIDENCE
RESIDENCE
RESIDENCE
RESIDENCE
STREET
STORAGE AND RESIDENCE
STORAGE
GENERAL MOSE

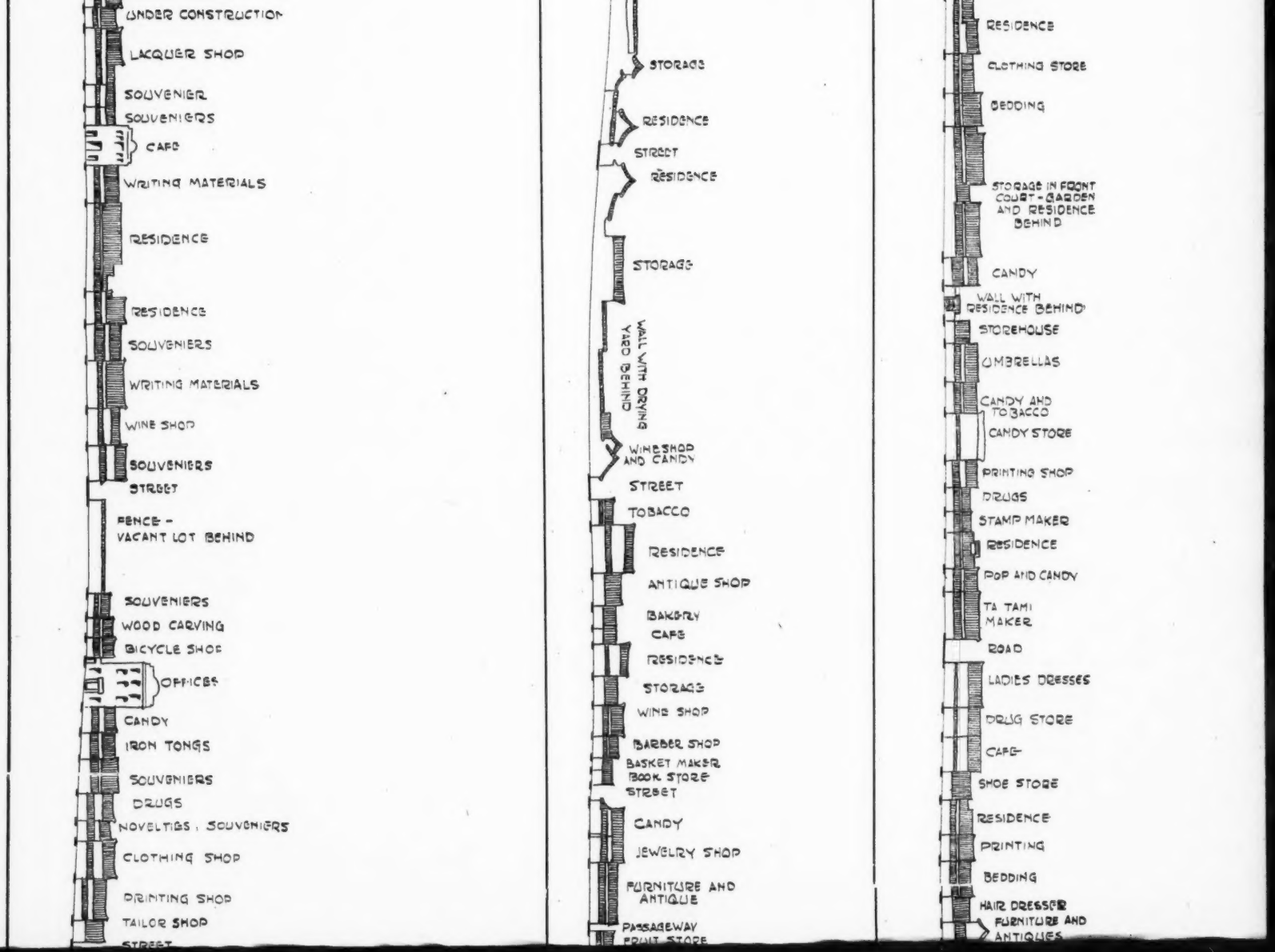
WALL WITH PARK BEHIND

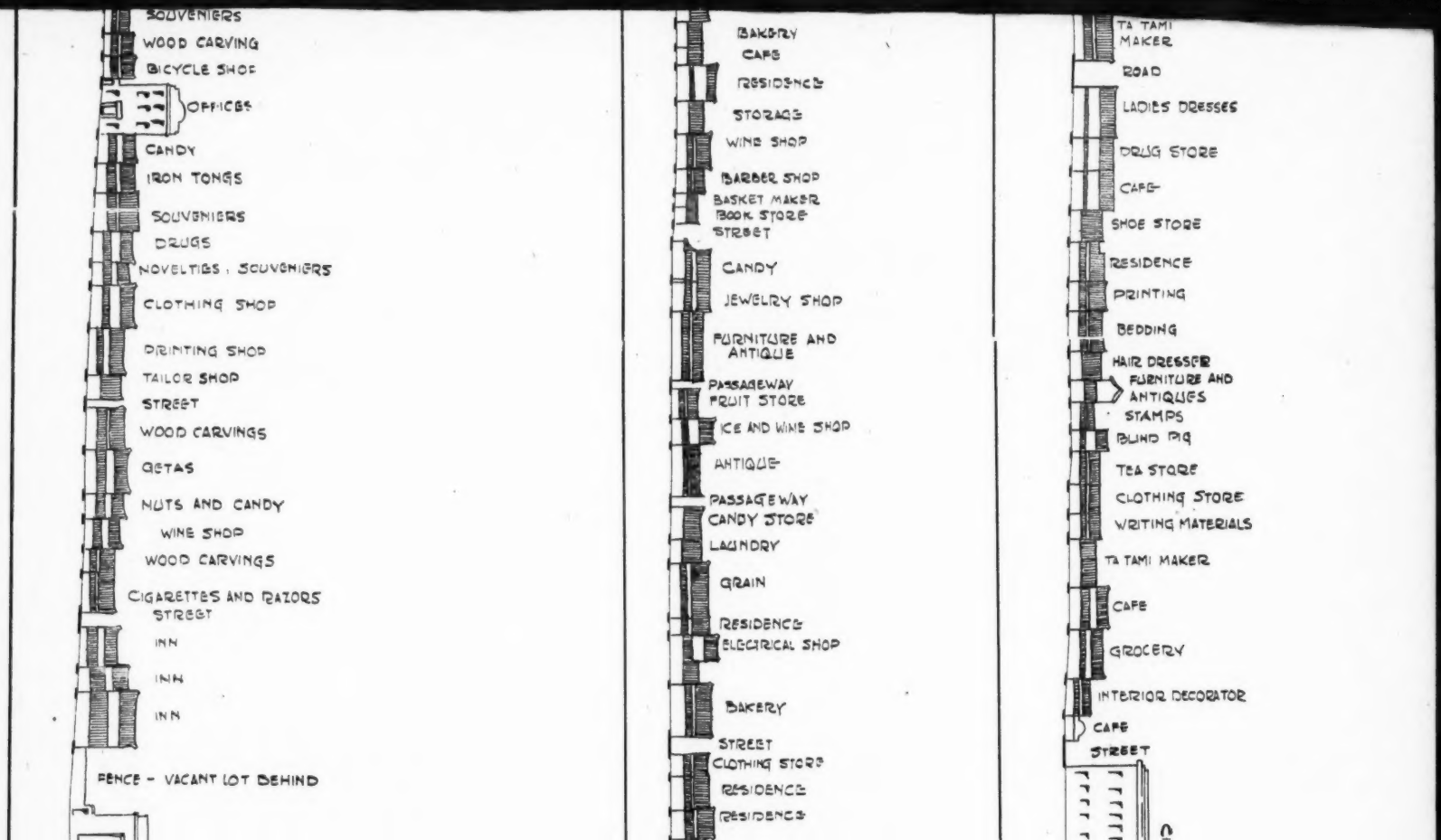

ART SHOP
PARK BESIDE CARP POND
STREET
INN
NOVELTIES
STREET
INN
CAFE
INN
GROCERIES
INN
BURNED -
UNDER REPAIR
INN
NOVELTIES
FRUIT
BICYCLES
SOUVENIERS
STREET
NARA HIGHER NORMAL COLLEGE
RESIDENCE
STORAGE
GENERAL MDSE
DISHES
COOKIE & CRACKER SHOP
RESIDENCE
RESIDENCE
STORE HOUSE
STREET
RESIDENCE
GETAS
BARBER SHOP
ANTIQUE SHOP
RESIDENCE
STORE HOUSE
STOREHOUSE
OCCULIST
HARDWARE
RESTAURANT
CAFE
STREET
RESIDENCE
CAFE
PASSAGEWAY
RESIDENCE
RESIDENCE
CLOTHING
WINE AND
STORAGE
HARDWARE
RESIDENCE

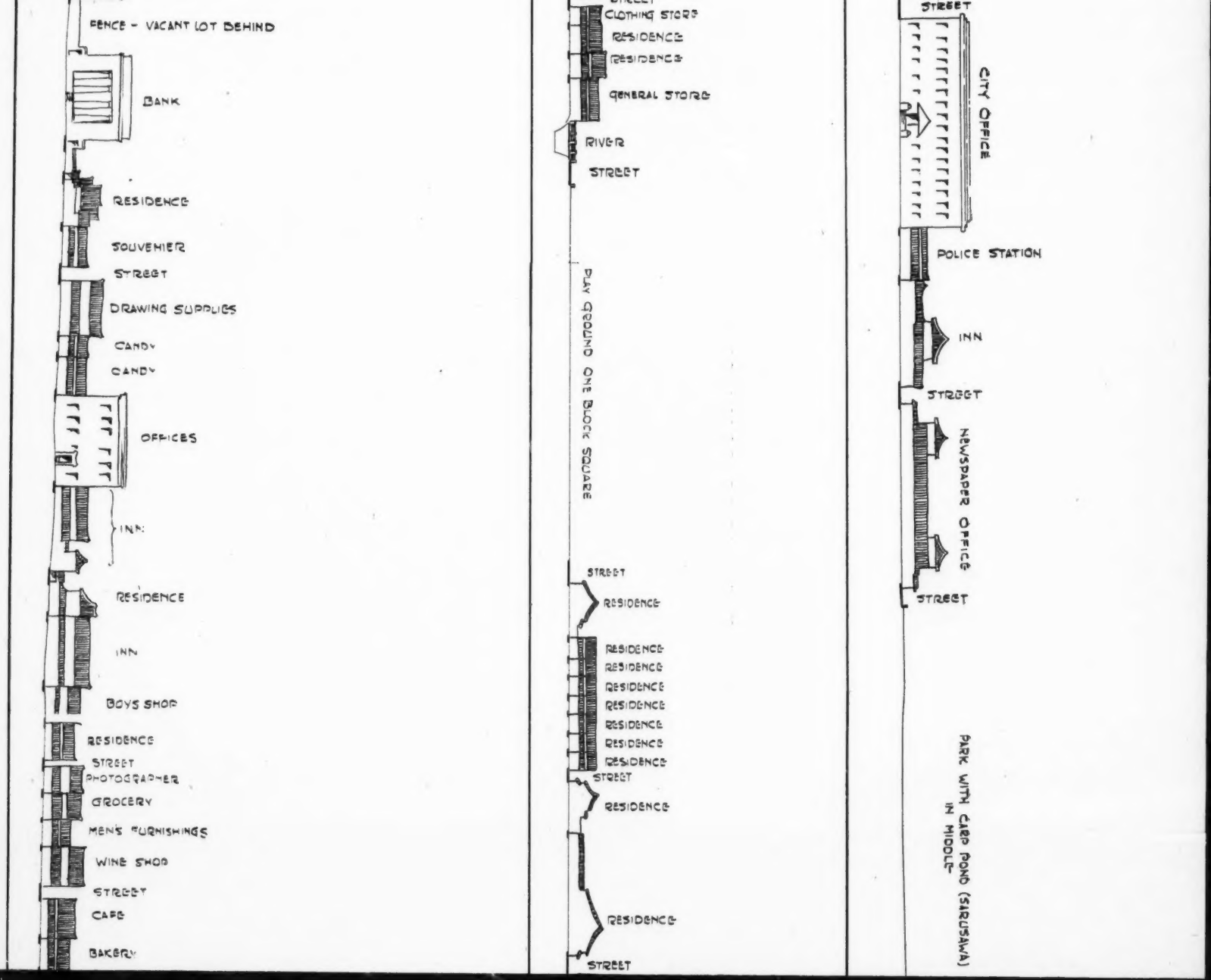

STREET
INN
NOVELTIES
STREET
INN
CAFE
INN
GROCERIES
INN
BURNED-
UNDER REPAIR
INN
NOVELTIES
FRUIT
BICYCLES
SOUVENIERS
NOVELTY SHOP
UMBRELLAS
ARCADE STREET
NOVELTIES
MEAT MARKET
UNDER CONSTRUCTION
LACQUER SHOP

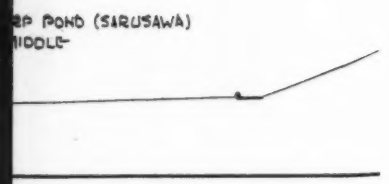

STORAGE

RESTAURANT
CAFE
STREET
RESIDENCE
CAFE
PASSAGEWAY
RESIDENCE
RESIDENCE
CLOTHING
WINE AND
STORAGE
HARDWARE
RESIDENCE
ANTIQUE
BAKERY
RESIDENCE
CLOTHING
FRUIT
STREET
RESIDENCE
CLOTHING STORE

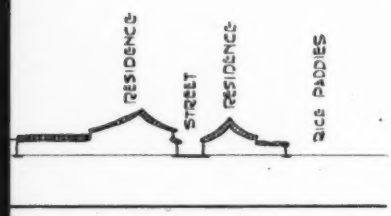

UNDER CONSTRUCTION
LACQUER SHOP
SOUVENIER
SOUVENIERS
CAFE
WRITING MATERIALS
RESIDENCE
RESIDENCE
SOUVENIERS
WRITING MATERIALS
WINE SHOP
SOUVENIERS
STREET
FENCE - VACANT LOT BEHIND
SOUVENIERS
WOOD CARVING
BICYCLE SHOP
OFFICES
CANDY
IRON TONGS
SOUVENIERS
DRUGS
NOVELTIES : SOUVENIERS
CLOTHING SHOP
PRINTING SHOP
TAILOR SHOP
STREET
STORAGE
RESIDENCE
STREET
RESIDENCE
STORAGE
WALL WITH DRYING YARD BEHIND
WINE SHOP AND CANDY
STREET
TOBACCO
RESIDENCE
ANTIQUE SHOP
BAKERY
CAFE
RESIDENCE
STORAGE
WINE SHOP
BARBER SHOP
BASKET MAKER
BOOK STORE
STREET
CANDY
JEWELRY SHOP
FURNITURE AND ANTIQUE
PASSAGEWAY
FRUIT STORE
RESIDENCE
CLOTHING STORE
BEDDING
STORAGE IN FRONT COURT - GARDEN AND RESIDENCE BEHIND
CANDY
WALL WITH RESIDENCE BEHIND
STOREHOUSE
UMBRELLAS
CANDY AND TOBACCO
CANDY STORE
PRINTING SHOP
DRUGS
STAMP MAKER
RESIDENCE
POP AND CANDY
TA TAMI MAKER
ROAD
LADIES DRESSES
DRUG STORE
CAFE
SHOE STORE
RESIDENCE
PRINTING
BEDDING
HAIR DRESSER
FURNITURE AND ANTIQUES


SOUVENIERS
WOOD CARVING
BICYCLE SHOP
OFFICES
CANDY
IRON TONGS
SOUVENIERS
DRUGS
NOVELTIES : SOUVENIERS
CLOTHING SHOP
PRINTING SHOP
TAILOR SHOP
STREET
WOOD CARVINGS
GETAS
NUTS AND CANDY
WINE SHOP
WOOD CARVINGS
CIGARETTES AND RAZORS
STREET
INN
INN
INN
FENCE - VACANT LOT BEHIND
BAKERY
CAFE
RESIDENCE
STORAGE
WINE SHOP
BARBER SHOP
BASKET MAKER
BOOK STORE
STREET
CANDY
JEWELRY SHOP
FURNITURE AND ANTIQUE
PASSAGEWAY
FRUIT STORE
ICE AND WINE SHOP
ANTIQUE
PASSAGEWAY
CANDY STORE
LAUNDRY
GRAIN
RESIDENCE
ELECTRICAL SHOP
BAKERY
STREET
CLOTHING STORE
RESIDENCE
RESIDENCE
TA TAMI MAKER
ROAD
LADIES DRESSES
DRUG STORE
CAFE
SHOE STORE
RESIDENCE
PRINTING
BEDDING
HAIR DRESSER
FURNITURE AND ANTIQUES
STAMPS
BLIND PIG
TEA STORE
CLOTHING STORE
WRITING MATERIALS
TA TAMI MAKER
CAFE
GROCERY
INTERIOR DECORATOR
CAFE
STREET

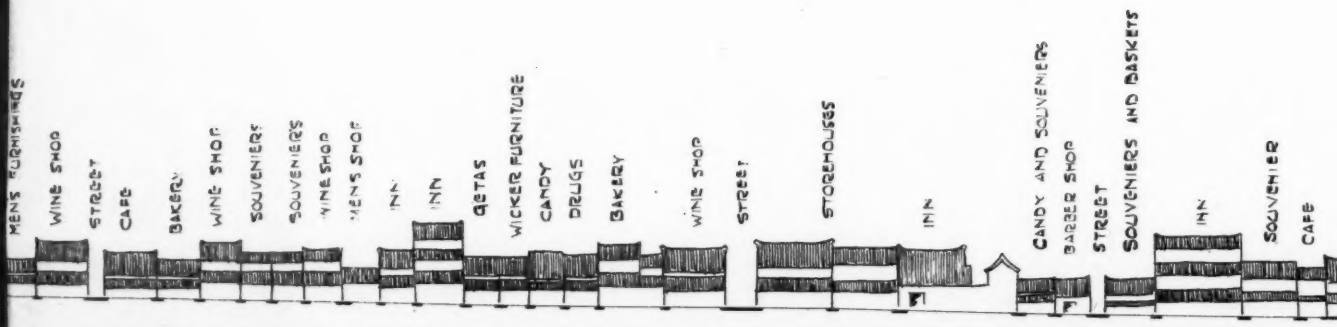

FENCE - VACANT LOT BEHIND
BANK
RESIDENCE
SOUVENIER
STREET
DRAWING SUPPLIES
CANDY
CANDY
OFFICES
INN
RESIDENCE
INN
BOYS SHOP
RESIDENCE
STREET
PHOTOGRAPHER
GROCERY
MEN'S FURNISHINGS
WINE SHOP
STREET
CAFE
BAKERY
STREET
CLOTHING STORE
RESIDENCE
RESIDENCE
GENERAL STORE
RIVER
STREET
PLAYGROUND ONE BLOCK SQUARE
STREET
RESIDENCE
RESIDENCE
RESIDENCE
RESIDENCE
RESIDENCE
RESIDENCE
RESIDENCE
RESIDENCE
STREET
RESIDENCE
RESIDENCE
STREET
STREET
CITY OFFICE
POLICE STATION
INN
STREET
NEWSPAPER OFFICE
STREET
PARK WITH CARP POND (SIRUSAWA) IN MIDDLE

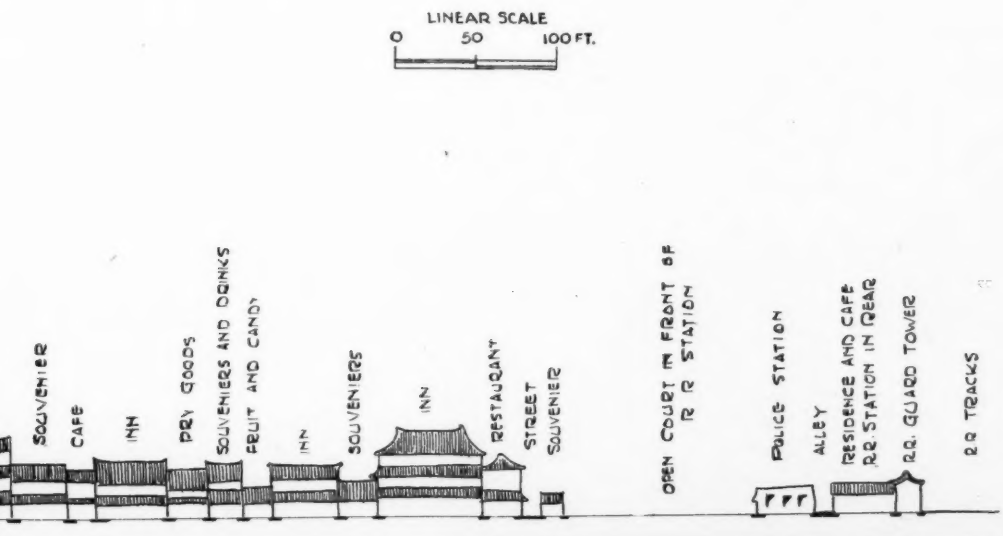


PROFILE A (at the left)—A North-south Secti



PROFILE B (below)—An East-west Section Th



south Section Through Nara City, along the street east of Sarasawa Pond (*see* Fig. 16).

Section Through Nara City, along Sanjo Dori (*see* Fig. 16).